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IBM Systems Reference Library

IBM 1410/7010 Operating System (1410-PR-155)
System Generation—1410-MI-965

System Generation provides the facilities for the creation and maintenance of a monitored system of IBM and user-supplied programs. The end product of System Generation is a System Operating File, including a System Monitor, that is tailored to provide an efficient Operating System for a specific machine environment.

This publication provides systems programmers and systems analysts with detailed information on the System Generation function. The publication describes the System Generation function; the programs used, and — primarily by means of examples — the procedures required for both tape-oriented and disk-oriented systems. Also included are machine requirements, core-storage requirements, and timing information for the elements of the IBM 1410/7010 Operating System. The use of the History file, a customer option, is also explained.

Prerequisite manuals are the 1410/7010 Operating System publications, *Basic Concepts,* Form C28-0318, and *System Monitor,* Form C28-0319. All other Operating System publications are recommended reading for a general knowledge of the various programs or programming systems to be generated and maintained.

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Purpose of This Publication

This publication provides systems programmers and systems analysts with detailed information on the System Generation function provided for the 1410/7010 Operating System. The use of a History file (a customer option) is discussed, and maintenance of the file by use of the SG3 program is explained.

Purpose of System Generation

System Generation provides facilities for the generation and maintenance of the IBM 1410/7010 Operating System, adapted to both the computer and the data processing requirements of an installation.

System Generation is a function performed within and for the Operating System, using various Operating System programs, under Monitor control.

Prerequisite and Related Literature

Prerequisite Literature

For an understanding of the basic concepts of the Operating System, the reader is directed to:

IBM 1410/7010 Operating System; Basic Concepts, Form C28-0318.

For details on features, functions, and capabilities of the Operating System, the reader is directed to:

IBM 1410/7010 Operating System; System Monitor, Form C28-0319.

Related Literature

The following IBM 1410/7010 Operating System publications are not prerequisite in their entirety to the System Generation function, but are recommended reading for a general knowledge of the appropriate program or programming system to be generated and maintained.

Basic Input/Output Control System, Form C28-0322
Random-Processing Scheduler, Form C28-0323
Tele-Processing® Supervisor, Form C28-0321
Utility Programs, Form C28-0353
Generalized Tape Sorting Program, Form C28-0354
Autocoder, Form C28-0326
COBOL, Form C28-0327
FORTRAN, Form C28-0328

Operating instructions for the Operating System, including instructions for System Generation, are contained in:

Operator's Guide, Form C28-0351.

A knowledge of material contained in some of the above publications is required for System Generation. Specific reference to the pertinent information is made in this publication.

Minimum Machine Requirements

Two versions of the IBM Master file are provided: one for a tape-oriented installation, the other for a disk-oriented installation. Each is designed to enable the user to perform his *initial* System Generation (the creation of a System Generator file). The following machine requirements are the minimum configuration needed for System Generation. The Master file runs on the minimum machine configuration, as well as any configuration that exceeds the minimum. (Processing Overlap and Priority special features, which are standard with the IBM 7010, are required.)

For the Tape-Oriented System

40,000 positions of core storage
5 magnetic tape units
1 card reader (or an additional tape unit)

NOTE: It is recommended that a printer or additional tape unit for the Standard Print Unit be supplied in addition to the above machine requirements.

For the Disk-Oriented System

60,000 positions of core storage
1 module of IBM 1301 Disk Storage
2 magnetic tape units
1 card reader (or one of the above tape units)

NOTE: It is recommended that a printer or additional tape unit for the Standard Print Unit be supplied in addition to the above machine requirements.

General Concepts

As distributed to the user, the Master file contains all the components of the 1410/7010 Operating System. From the Master file, the user generates a System Generator file (SGF). From the SGF, the user creates one or more System Operating Files (SOF) designed to perform specific data processing functions.

Definitions

Frequently used basic terms are defined below in relation to their use in this publication.

Monitor: The System Monitor without the Linkage Loader; that is, the combination of Bootstrap, Resident Monitor (including the Resident IOCS), and Transitional Monitor.

Operating Section: All operating programs in absolute format (ready to execute). Monitor is part of the operating section.

Library: An organized collection of subprograms or data to be used as input for System Generation. There are three types of libraries:

1. Relocatable Library: Compiled subprograms in relocatable format.
2. Macro Library: All the macro routines available to the Autocoder processor.
3. Create Library: Prewritten packets of Linkage Loader control cards used to conveniently process standard programs into absolute format.

Directory: A record, built during System Generation, that contains the names and relative locations of the items of an associated file.

Header: An identifying record at the beginning of every program phase or library.

Largest Possible Records: An option offered for tape-oriented System Generation (specifically, the SG2 program). If this option is exercised, a phase of a program will be written in records of 10,770 characters. The last record of the phase may be shorter to contain any remaining characters.

Macro Generation: An Autocoder function whereby symbolic statements are extracted from the Macro Library and become a portion of the subprogram being assembled.

Disk: Refers to IBM 1301 Disk Storage.

Geometric Record Address: A disk record address whose four high-order digits are identical to the track number on which the record resides.

Master File: An IBM-supplied source file consisting of:

1. A *minimum* Monitor capable of operating on any acceptable machine configuration;
2. A *basic* operating section capable of System Generation; and,
3. The Relocatable, Macro, and Create Libraries.

System Generator File (SGF): A system file consisting of:

1. A Monitor designed to operate efficiently in a particular installation environment;
2. An operating section capable of System Generation; and
3. The library subprograms required for System Generation.

System Operating File (SOF): A system file consisting of:

1. A Monitor designed to operate efficiently in a particular installation environment;
2. An operating section designed to efficiently process the user's programs and data; and,
3. The library subprograms required for user processing.

The primary difference between the IBM Master file and an SGF is the Monitor. On the Master file, the Monitor is designed to operate in the minimum machine environment. To gain full advantage of the Operating System, the user constructs his Monitor to utilize the facilities of his installation, and also selects any IOCS or system function options (e.g., tape-label checking and unusual-end-of-program memory print) that would be useful to him. After an SGF is created, the Master file need not be used again, since the SGF effectively becomes the installation's "Master file."

The distinction between an SGF and an SOF is based entirely on operating efficiency. The primary difference between them is that the SGF *must* contain those elements required for System Generation, but an SOF need not contain them. An SGF is designed for System Generation; an SOF for production work.

Tape- and Disk-Oriented Systems

Orientation toward tape or disk is determined by the device (tape or disk) from which the Resident Monitor is loaded into core storage. Both systems are distributed by IBM as single reels of tape — the Master file. The Master file for disk must be loaded onto disk storage before it can be used for System Generation.

TAPE SYSTEM

The operating programs on the Master file for tape are designed for tape usage. The user can, after the initial System Generation, design his system to use disk storage files within the tape system (e.g., a disk file can be used for data files).

DISK SYSTEM

The operating programs on the Master file for disk are designed for disk usage. Two tape units are mandatory for System Generation. The Disk Load program is supplied in order to copy the system onto disk. The user can, after initial System Generation, design his programs to use tape files within the disk system (e.g., a tape file can be used for data files).

The Processing Overlap and Priority special features are required to use the 1410/7010 Operating System.

System Generation

The machine requirements for generation of the SGF from the Master file are described in the Introduction to this publication.

Data Processing

UNIT-RECORD REQUIREMENTS

All configurations of the Operating System require:

1 IBM 1402 Card Read Punch, Model 2, for use as the Standard Input Unit (SIU) and/or the Standard Punch Unit (SPU); or 1 IBM 1442 Card Reader, Model 3, for the SIU.

1 IBM 1403 Printer, Model 2, for use as the Standard Print Unit (SPR)

NOTE 1: Tape units may be substituted for each of the functions of card reading, card punching, and printing.

NOTE 2: At the option of the user, punch and printer output may be intermixed on one tape unit for subsequent off-line punching and printing on an IBM 1401 Data Processing System.

NOTE 3: At the option of the user, the standard print and/or standard punch capability may be eliminated from the Resident Monitor. If no print unit is specified, (a) no diagnostic messages or memory map are provided by the Linkage Loader and (b) no compiler printed output is possible even though the compilers will operate. If no punch unit is specified, the compilers will operate, but no program cards will be produced.

TAPE-ORIENTED SYSTEMS

In addition to the unit-record requirements, tape-oriented systems require:

1 tape unit for a System Operating File (SOF)

1 tape unit for a Job file (MJB)

1 tape unit for a System Library file if this file is not on the same reel of tape as the SOF

NOTE 1: If a Core Image file (MDM) is desired, an additional tape unit must be provided. This unit is not available for any other use.

NOTE 2: The tape unit designated as the Job file is available as a work file if the program is loaded from the SOF.

Compiler Requirements: The three compilers (COBOL, FORTRAN, and Autocoder) share work files. The user may include any or all three compilers in his system.

In addition to the requirements listed for a tape-oriented system, the compilers require:

3 tape units used as work files for the Autocoder and COBOL compilers, but 2 tape units for the FORTRAN compiler

1 additional tape unit if the compile-and-go capability is used

NOTE: The tape designated as the Job file may be used as a work file during compilation.

1301 DISK-ORIENTED SYSTEMS

In addition to the unit-record requirements, disk-oriented systems require a series of contiguous cylinders formatted in the Load mode, one record per track, consisting of:

1. Six cylinders for basic programs on the SOF.
2. Additional cylinders to accommodate:
   COBOL—3 cylinders
   FORTRAN—2 cylinders
   Autocoder—7 cylinders
   Utilities and Sort Definition Program—1 cylinder
   Job file—Each cylinder can store approximately 60,000 positions of core storage; e.g., 6 cylinders are required for disk-oriented System Generation
   Working storage used by the compilers—No less than 2 cylinders per file and a greater number according to the size of the program being compiled (should not exceed 10 cylinders per file)
   User-supplied programs—Each cylinder can store approximately 60,000 positions of core storage.
3. Five additional cylinders if the compile-and-go capability is used. These five cylinders can accommodate approximately 4,400 subprogram card-image records that are the output from the compilers. (To increase this capacity, additional cylinders may be provided. Each additional cylinder can store approximately 880 card-image records.)

4. Cylinders to accommodate the System Library file of relocatable programs as follows:

The IBMLIBR requires 25 cylinders containing, in part, 1 cylinder for COBOL subprograms and 4 cylinders for FORTRAN subprograms.

Additional cylinders for user-supplied subprograms (each cylinder can store approximately 880 card-image records).

NOTE: If a Core Image file (MDM) is desired, a tape unit must be provided. This unit is not available for any other use.

GENERALIZED TAPE SORTING PROGRAM REQUIREMENTS

In addition to the requirements listed for tape- and disk-oriented systems, the Generalized Tape Sorting program requires a minimum of four tape units. For a tape-oriented system, these may be the same units used as work files by the compilers. Additional tape units may be used to increase the program's efficiency. (See the publication, *Generalized Tape Sorting Program.)*

NOTE: The tape unit designated as the Job file for the tape-oriented system may be used as one of the four tape units for the sorting program, if the sorting program is loaded from the SOF.

TELE-PROCESSING SYSTEM REQUIREMENTS

Tape-Oriented Tele-Processing Supervisor: 1 tape unit for storage of the TP Library file.

1301 Disk-Oriented Tele-Processing Supervisor: 1 cylinder of disk storage, formatted in the Load mode, for storage of the Tele-Processing Supervisor.

Additional cylinders of disk storage, formatted in the Load mode, for storage of TP programs. The effective capacity of each cylinder is dependent upon the format used (i.e., relocatable or absolute) and the average size of the TP programs.

To unload and reload the main-line program, the user must provide a tape unit for the Temporary Storage file (MDT). This unit is not available for any other use.

This section applies only to a tape-oriented system and need not be read by persons interested only in a disk-oriented system.

How the System is Built

Functions to be Performed

The Master file contains an operating section capable of building an SGF. The SGF incorporates those options desired by the user. To build the SGF, several programs from the operating section, which are in absolute format, are executed. These programs perform the following functions:

1. Accept input data that describes the environment under which the new system is to operate, and incorporate the optional items defined by each user.
2. Preserve, for later use, any or all of the library elements supplied on the Master file.
3. Build the absolute programs that the user specifies.
4. Place these absolute programs on the output file. At the time this operation is being performed, the library material preserved in step 2 can be merged onto the output file. At the same time, directories are merged onto the output file.

Programs Required

To perform the above functions, the following four programs are executed.

AUTOCODER: The user describes the machine configuration and selects the various options from those available in the form of Autocoder source statements. Autocoder processes this input by means of macro routines and generates the nucleus of the new Monitor.

SG1: This program performs two main functions.

1. scl locates and copies the library material that the user desires to include in the new system.
2. scl prepares a tape that contains input *control* information for the Linkage Loader (LINKLOAD program).

LINKLOAD: This program performs its standard function of converting relocatable routines into absolute format. It reads control information from the work tape produced by scl. The *relocatable input* that it processes comes from:

1. The output of the Autocoder run; and
2. The Relocatable Library supplied on the Master file. The output, in absolute form, is placed onto the Job file, MJB.

SG2: This program produces the directories required and merges the programs, directories, and libraries into the new file.

Defining the System

Each user must define, through control cards, the Operating System that he desires. A detailed description of the control cards is presented in "System Description Control Cards" and "System Generation Control Cards." Briefly, the user specifies the following:

1. The number and types of input/output devices. A two-character assignment symbol is specified by the user to be used in all references to each device.
2. The variable and optional features desired within the Resident Monitor.
3. The number and types of symbolic units required.
4. The variable and optional features desired within the Resident IOCS.

Building an SGF

This operation is the first step in System Generation. This section describes the steps leading to this initial SGF run.

The user must give careful consideration to the various options available within the system. By choosing those options best suited to his needs, in addition to being aware of his installation's machine configuration, the user can prepare the control cards described in the section, "Organization of the Control Deck for the SGF."

Construction of the File

Each user must analyze his requirements for programs supplied to him on the Master file. The operating section of the Master file consists of the programs required to do the initial run, Master to SGF. The operating section is used in conjunction with the Relocatable, Macro, and Create Libraries to construct the SGF.

A user may choose to utilize one of the Create Library packets that will generate a "standard set" of

programs on the SGF. These programs are those that a typical user might require.

If a specified requirement must be met which is not covered by a Create Library packet, the user must provide the appropriate Linkage Loader control cards. The packet, or the use of individual create capabilities, determines the ultimate sequence of programs on the SGF.

Organization of the Control Deck for the SGF

The control deck for this operation is composed of the following sections. Additional information is given in the publication, *System Monitor.*

1. Initialization, including the DATE card.
2. JOB.
3. ASGN cards assign symbolic unit entries to physical input/output devices.
4. MODE card describes the program operation wanted for the job.
5. EXEQ AUTOCODER card causes monitor to locate and load the Autocoder processor. The card is followed by Autocoder source statements. These are macro statements that define the system.
6. EXEQ SG1 card causes the system to locate and load SG1. The cards which follow this EXEQ card are divided into two categories. SG control cards, Classes II, III, and IV, instruct SG1 to locate and copy libraries. CREAT control cards direct SG1 to build a work file for the Linkage Loader.

NOTE: CREAT control cards may be interspersed with (or replaced by) Linkage Loader control cards.

7. EXEQ LINKLOAD card causes the Linkage Loader to be located and loaded. The Linkage Loader is directed to obtain its control information from the file just created by SG1. Output is placed on the Job file.
8. EXEQ SG2 card causes SG2 to be located and loaded. The SG2 program has no control input. It can only be executed following one or more of the above programs that have prepared input data on predetermined symbolic units.
9. END.

EXAMPLE 1

Figure 1 illustrates the control cards needed to build a typical SGF.

```
MON$$    DATE YYDDD
MON$$    JOB  GENERATE TAPE ORIENTED SGF
MON$$    ASGN MW1,B4
MON$$    ASGN MW2,A5
MON$$    ASGN MW3,B5
MON$$    ASGN MJB,A1
MON$$    ASGN MR0,A3
MON$$    ASGN MGO,B2
MON$$    MODE GO,SG
MON$$    EXEQ AUTOCODER,,,NOFLG,NOPCH
         HEADRGENERATE SGF
         GEN01U3,U1,U2
         GEN02/MDM/,1,A0,A1,A2,A3,A4,A5,A6,A7,A8,A9
         GEN02/MDM/,2,B0,B1,B2,B3,B4,B5,B6,B7,B8,B9
         GEN081700090119,,55,5,099,A0,U1,,,U3,U2,,,B6,SNAP
         GEN0910
         GEN1010,A4,B4,A5,B5,A6
         GEN11
         DEVDF1,729,1402,1403
         DEVDF2,7330
         IOKDF1410,,A,4,5,,,,,70000
         END
MON$$    EXEQ SG1                                          7
         LOCATC,CREATLIB
         INSERC
         LOCATR,IBMLIBR
         INSERR
         LOCATM,AUTOCODER
         INSERM
         END
         CREATTSYSTEM
         END
MON$$    EXEQ LINKLOAD
         INPUTMW2
MON$$    EXEQ SG2                                         L7
MON$$    END
```

Figure 1. Control Cards Required for a Typical SGF for a Tape-Oriented System

The sample deck begins with the initialization information. This is followed by the JOB card. ASGN cards assign symbolic units to specific input/output devices through their assignment symbols.

The MODE card indicates that the output from any compiler is to be written on the Go file, MGO. This same card indicates that the operations that follow are to be executed in SG mode. This sets internal indicators that are tested by dependent programs and condition or alter their mode of operation.

The EXEQ Autocoder card contains the fourth operand (NOFLG) and the fifth operand (NOPCH). The NOFLG operand is a signal to Autocoder that the source statements that follow will knowingly violate the rules governing use of index registers, hence flags that would normally be a diagnostic warning should be suppressed. The NOPCH parameter suppresses the punch output from this compilation.

The first source card to Autocoder is a HEADR card, which serves to identify the run.

By comparing the sample cards with the detailed description of the input control cards given later in this publication, the input to Autocoder can be seen to indicate the following:

Unit record equipment will be available on channel 1. The Core Image file will always be available on the new system.
Magnetic tape units will be available on two channels, ten tape units per channel.
The system will be a 1410 Data Processing System.
Core-storage size will be 80,000 positions.
The system will be tape oriented.
The system files will contain no tape labels.
There will be no Tele-Processing devices.
The Core Image file (MDM) will be available.
The POW program will not be included.
The Standard Print Unit will be a 1403 Printer.
The Standard Punch Unit will be a unit-record punch.
An AIU will be included.
The number of lines per page will be 55.
The size of console inquiry message area will consist of five core-storage positions.
JOB cards will not be punched.
All Monitor control cards will be typed and printed.
The new system tape normally will be mounted on a tape unit whose assignment symbol is A0.
The SIU will reference U1.
The SPR will reference U3.
The SPU will reference U2.
The Core Image file (MDM) will reference B6.
The Resident Monitor will include the Snapshot utility routine.
Ten reserve units will be established.
Ten work units will be established.
The IOCS will provide routines for unit-record equipment and 729 tape units on channel 1.
The IOCS will provide routines for 7330 (and 729) tape units on channel 2.
The IOCS will have routines to check 120-character tape labels (no exits provided).
Error statistics are to be accumulated.
User-written service routines will be provided for.
The third record written on the Core Image file (MDM) will be written from location 70000.
The last source statement to Autocoder is the END card.

The EXEQ SG1 card contains a 7 in column 59 to indicate the actual machine size.

The control cards that follow the EXEQ SG1 card request SG1 to copy the Create Library (CREATLIB), the Relocatable Library (IBMLIBR), and the Macro Library (which is a part of Autocoder). These requests are terminated by the first END card.

The second section of SG1 control cards begins with the CREAT TSYSTEM card. This card requests SG1 to locate the Create package specified and to produce control information for the Linkage Loader (LINKLOAD). The control information will be in the form of Linkage Loader control cards (e.g., PHASE, CALL, CALLN).

This section is also terminated with an END card.

The EXEQ LINKLOAD card is followed by the INPUT MW2 card. The INPUT card directs LINKLOAD to obtain its control information from the tape file MW2 prepared by SG1.

The EXEQ SG2 card contains additional control punches:

COLUMN	CONTENTS	
58	L	Any character in this column indicates that the output should be constructed with "largest possible records."
59	7	Character indicates the actual machine size.

SG2 now merges the information processed above onto the new SGF. The sequence of the SGF is determined by the sequence of information on the Job file, MJB.

SG2 also processes requests contained on the Job file for directories and libraries.

The final output, the SGF, appears on tape file MW2.

Building an SOF

This function is essentially a copy operation. Each item to be copied must be specifically requested. Any item(s) not specifically requested will not appear on the output file.

Organization of the File

In Example 1, the programs required for the SOF run were converted into absolute format records. Hence, for this example, the most efficient way to produce the SOF is to request that this file be constructed in the same sequence as the SGF. However, it is possible to resequence any or all of the operating section programs to produce a system that is most efficient from an operating viewpoint. In any case, the following programs *must* appear first on the SOF in the following order listed:

IBBOOT
IBRESMON
IBTRANSIT

Organization of the Control Deck for the SOF

The control deck for this operation is composed of the following sections:

1. Initialization, including the DATE card.
2. JOB.
3. ASGN cards.
4. EXEQ SG1. SG1 control cards, Classes II, III, and IV, direct SG1 to locate and copy libraries. SG1 control cards, Class I, give the names of the specific items to be copied. Note that the sequence of these requests determines the sequence of the new file.
5. EXEQ SG2. This card causes SG2 to build the final output tape.
6. END.

EXAMPLE 2

Figure 2 illustrates the control cards needed to build a typical SOF.

```
MON$$    DATE YYDDD
MON$$    JOB  COPY SOF WITH MULTIPLE TRANSITIONAL MONITORS
MON$$    ASGN MW1,B1
MON$$    ASGN MW2,B2
MON$$    ASGN MJB,A1
MON$$    ASGN MRO,A3
MON$$    EXEQ SG1
         LOCATR,IBMLIBR
         INSERR
         LOCATC,CREATLIB
         INSERC
         LOCATM,AUTOCODER
         INSERM
         END
         INCLDIBBOOT
         INCLDIBRESMON
         INCLDIBTRANSIT
         INCLDAUTOCODER
         INCLDIBTRANSIT
         INCLDLINKLOAD
         INCLDIBMLIBR
         INCLDIBTRANSIT
         INCLDUTILITIES
         INCLDSG1
         INCLDCREATLIB
         INCLDSG2
         INCLDIBTRANSIT
         INCLDFORTRAN
         INCLDIBTRANSIT
         INCLDSORTDEFINE
         INCLDIBTRANSIT
         END
MON$$    EXEQ SG2
MON$$    END
```

Figure 2. Control Cards Required for a Typical SOF for a Tape-Oriented System

The sample deck begins with standard initialization information, a JOB card, and ASGN cards.

The EXEQ SG1 card used for this run does not require machine size indication in column 59; it is assumed that the SGF reflects the actual machine size.

The EXEQ card is followed by requests to locate and copy the desired libraries. This section of control cards terminates with an END card.

The next group of control cards contains specific requests to copy individual items from the input file. These requests determine the sequence of the final output file (SOF). Contained in this group are specific requests to INCLD the IBMLIBR and the CREATLIB. These cards are required to establish the relative location of these items. SG1 will prepare a request (for SG2) to show the location desired. Note that several copies of IBTRANSIT have been requested. The group of control cards also terminates with an END card.

The EXEQ SG2 card causes SG2 to build the final output tape. The functions performed by this program are the same as those outlined in Example 1.

Addition of a User-Written Program

An operation that is frequently carried out is the addition of a user-written program to the operating section of an SOF. This function, like the previous illustrations, involves the building of a new system tape.

Organization of SOF to be Updated

To accomplish the updating of a system, the full capabilities of SG1 can be employed. Therefore, the user may choose to resequence the operating section of the new SOF. The only restriction on sequencing is that IBBOOT, IBRESMON, and IBTRANSIT must be the first items on the output file.

Organization of the Control Deck

Control cards follow the pattern established in Example 2 when adding additional programs to the SOF. However, additional cards are required to:

1. Establish MODE SG; and
2. Add the additional program, and resume the normal SG1 functions.

The sequence of the final output is determined from the sequence of the Job file. Because of this, the location of the additional cards is important.

The first EXEQ SG1 card begins requests that preserve the library elements that are to be retained. This section terminates with an END card.

The INCLD cards direct SG1 to build a Job file in the sequence specified. At the point where the new program(s) are to be inserted, SG1 functions are terminated (temporarily) by an END card.

The card EXEQ LINKLOAD, followed by the necessary control information and input deck(s), build the new program(s) onto the Job file.

At the completion of LINKLOAD, the EXEQ SG1 card appears again to cause the resumption of normal processing. This causes the remaining programs to be placed on the Job file.

EXAMPLE 3

Figure 3 illustrates the addition of a user-written program to the operating section of an SOF.

The sample deck begins with the DATE, JOB, and ASGN cards.

The MODE SG card establishes the mode for the programs that follow. This alters the normal operation of LINKLOAD so as to cause it to record information on a work file for SG2.

EXEQ SG1 is followed by requests to preserve library material. This section terminates with an END card.

The next cards are SG1 Class I requests to copy programs from the operating section on the Job file. This section is also terminated with an END card.

The EXEQ LINKLOAD card is followed by Linkage Loader control and input cards. In this example, the user's program has been previously compiled, and the relocatable deck from the compilation is placed immediately after the PHASE card.

The EXEQ SG1 card is required only if it is necessary to resume the SG1 function. In this example, SG1 is re-

```
MON$$      DATE YYDDD
MON$$      JOB  UPDATE DECK
MON$$      ASGN MJB,A1
MON$$      ASGN MR0,A3
MON$$      ASGN MW1,B4
MON$$      ASGN MW2,A5
MON$$      MODE SG
MON$$      EXEQ SG1
           LOCATR,IBMLIBR
           INSERR
           LOCATM,AUTOCODER
           INSERM
           END
           INCLDIBBOOT
           INCLDIBRESMON
           INCLDIBTRANSIT
           INCLDAUTOCODER
           INCLDLINKLOAD
           INCLDIBMLIBR
           END
MON$$      EXEQ LINKLOAD
           PHASEUSERPROG
**********RELOCATABLE DECK**********
MON$$      EXEQ SG1
           INCLDSORTDEFINE
           INCLDIBTRANSIT
           END
MON$$      EXEQ SG2
MON$$      END
```

Figure 3. Control Cards Required to Add a User-Written Program to the SOF of a Tape-Oriented System

quired because the new program to be inserted was *not* to be at the end of the Job file.

Additional SG1 Class I cards follow, specifying the programs to be copied onto the Job file. This section terminates with an END card.

NOTE: At this point, the Job file is in the sequence desired for the output file.

The EXEQ SG2 card causes SG2 to build the new tape in the same sequence as the Job file. At this time, library information and directories are merged onto the new tape wherever they have been requested.

General Maintenance Considerations

Maintenance of the operating system covers many possible variations. Listed below are some of the important aspects:

Change to Monitor: Requires complete regeneration of the SGF, SOF, all Job files that have been saved, and all TP Library files.

Change to a Dependent Program in the Operating Section: Requires recompilation of affected modules, copying (INCLD) any unaffected programs, and regeneration of affected programs.

Change to Library (other than Monitor library elements): Requires updating of library, plus regeneration of any programs in the operating section which were affected. As in item 2, any unaffected programs can be copied by use of the INCLD *card.* By careful planning, the user should be able to make changes to an existing relocatable library and also incorporate those changes into a new operating section as part of one job. For this type of operation, the reader should review the control card descriptions concerning the operation of the Go file during maintenance of the Relocatable Library. Refer to Class IV control cards INSER and REPLC, under "System Generation Control Cards."

A careful study of the control card descriptions is required to utilize the maintenance capabilities efficiently.

Check List for System Generation (Tape Oriented)

1. The programs in System Generation use the last (highest) core-storage position as a starting point from which certain elements are built.
2. The absolute records size option (EXEQ SG2 card) for systems that include Tele-Processing devices should not specify largest possible records.
3. The Sort Definition program should be generated by the initial generation if sort or merge programs are desired on an SOF.
4. Multiple copies of the Transitional Monitor should be placed on the SOF to minimize the search time required for this element during operation. The Resident Monitor always makes a forward search for the Transitional Monitor.
5. The user can modify the Macro Library and the Create Library, but cannot create additional libraries with records of the same format as these libraries. A Relocatable Library can also be modified and the user can create as many relocatable libraries as desired, with the one restriction that only one of these can be named IBMLIBR (or any other name). IBMLIBR is the name used by the Linkage Loader to find the System Library file if the user does not specify a different one. For relocatable libraries on separate reels, any name, including IBMLIBR, can be assigned.
6. COBOL and Autocoder use symbolic units MW1, MW2, and MW3 for work files during compilation; FORTRAN uses MW1 and MW2. MW1 and MW3 should be assigned to a different channel from MW2 for balanced and efficient usage. One additional tape unit is required if the compile-and-go capability is used.
7. The Create Library must be named CREATLIB.
8. If the COBOL "ENTER" verb is used in conjunction with FORTRAN subprograms, the relocatable modules required to run with COBOL and FORTRAN object programs must be in the *same* Relocatable Library.

9. Every system must have the Bootstrap, the Resident Monitor, and the Transitional Monitor (in that order) at the beginning of the tape.

10. The maximum number of items that may appear on an SOF is 154. An item is defined as a program or a library. (Examples: COBOL is one item and IBMLIBR is one item.)

11. Table 1 indicates the ASGN cards that are required during System Generation.

12. The Generalized Tape Sorting program requires a minimum of four tape units. These may be the same tape units as those used as work files by compilers. Additional tape units increase the program's efficiency. See the publication, *Generalized Tape Sorting Program.*

13. System Generation must be the last job(s) or only job(s) in a batch. Other batch processing cannot be performed until the system has been reinitialized.

	Physical Unit	1	2	3	4	5 *	6	7 *	8	9
	Symbolic Unit	SOF	SIU	MW1	MW2	MW3	MJB	MGO	MR0	SPR
Program used in System Generation	Autocoder	Required	Required	Work File	Work File	Work File		Output		Optional
	SG1			Library Directory Work File	Linkage Loader Input File		Output	Possible Input		
	SORT-DEFINE				Linkage Loader Input File			Held		
	LINKLOAD			Library Directory Work File	Linkage Looder Input File		Output	Input		
	SG2			Library Directory Work File	New SOF (Finol Output File)		Input		Directory Work File	

* For the minimum configurotion, MW3 ond MJB, ond MGO ond MR0 shore the some physical units.

Table 1. Tape System Input/Output Requirements

This section applies only to a disk-oriented system and need not be read by persons interested only in a tape-oriented system.

How the System is Built

Functions to be Performed

The Master file contains a bootstrap disk load program that loads the Master file on the disk in preparation for System Generation. The absolute portion that is loaded on the disk is capable of building an SGF. The SGF incorporates those options desired by the user. To build the SGF, several programs from the operating section, which are in absolute format, are executed. These programs perform the following functions:

1. Accept input data that describes the environment within which the new system is to operate, and incorporate the optional items defined by each user.
2. Build absolute programs that the user specifies.
3. Place these absolute programs on the output file.
4. Place the library elements on the output file.

Programs Required

To perform the above functions, the following four programs are executed:

AUTOCODER: The user describes the machine configuration and the various options available in the form of Autocoder source statements. Autocoder processes this input by means of macro routines and generates the nucleus of the new system.

SG1: This program performs one function. It prepares a tape which contains input *control* information for the Linkage Loader (LINKLOAD program).

LINKLOAD: This program performs its standard function of converting relocatable routines into absolute format. It reads control information from the work tape produced by SG1 and/or control cards from the SIU. The *relocatable input* that it processes comes from:

1. The output of the Autocoder run (step 1 above); and
2. The Relocatable Library supplied on the Master file. (This library must have been loaded onto the disk.)

The output, in absolute form, is placed onto the Job file, MJB.

SG2: This program locates and copies the library elements that the user desires in the new system. Its output is a new tape that is capable of being loaded onto the disk. This tape contains all items generated.

Defining the System

The user must describe the Operating System that he desires through control cards. A detailed description of the control cards appears in "System Description Control Cards" and "System Generation Control Cards."

Briefly, the user supplies the following:

1. The number and types of input/output devices. A two-character assignment symbol is specified by the user to be used in all references to each device.
2. The variable and optional features desired within Resident Monitor.
3. The number and types of symbolic unit entries required.
4. The variable and optional features desired within the Resident IOCS.

Loading the Master File on the Disk

Before building an SGF or SOF, it is necessary for the user to load the Master file or the source SGF onto disk storage. Instructions for performing this transfer to disk storage are given in "Disk Load Program."

Building an SGF

This operation is the first step in System Generation. This section describes the steps leading to this initial SGF run.

The user must give careful consideration to the various options available within the system. By choosing those options best suited to his needs, besides being aware of his installation's machine configuration, the user can prepare the control cards discussed in the section, "Organization of the Control Deck for the SGF."

Construction of the File

Each user must analyze his requirements for programs supplied to him on the Master file. The operating section of the Master file consists of the programs required to do the initial run, Master to SGF. The operating sec-

tion is used in conjunction with the Relocatable, Macro, and Create Libraries to construct the SGF.

A user may choose to utilize one of the Create Library packets that will generate a "standard set" of programs on the SGF. These programs are those that a typical user might require.

If a specific requirement must be met which is not covered by a Create Library packet, the user must provide the appropriate Linkage Loader control cards.

Organization of the Control Deck for the SGF

The control deck for this operation is composed of the following sections. Additional information is given in the publication, *System Monitor.*

1. Initialization, including BOOT1 card and the DATE card (Figure 4 shows a 1410 bootstrap card for channel 1.)
2. JOB.
3. ASGN cards assign symbolic unit entries to physical input/output devices.
4. MODE card describes the program operation wanted for the job.
5. EXEQ AUTOCODER card causes Monitor to locate and load Autocoder. The card is followed by Autocoder source statements. These cards define the system.
6. EXEQ SG1 card causes the system to locate and load SG1. The cards that follow this EXEQ card must be Class III SG control cards. CREAT control cards direct SG1 to create a work file for the Linkage Loader.

NOTE: SG control cards, Class III, may be interspersed with (or replaced by) Linkage Loader control cards.

7. EXEQ LINKLOAD card causes the Linkage Loader to be located and loaded. The Linkage Loader is directed to obtain its control information from the file just created by SG1.
8. EXEQ SG2 card causes SG2 to be located and loaded. The cards that follow this EXEQ card are divided into two distinct groups. The first group consists of Class I SG control cards only. The Class I control cards direct SG2 to locate the named elements and to copy them onto the new output file.

The second group is made up of Class II, III, and IV control cards. (Class IV control cards must be last.) This group directs SG2 to perform some operations on the libraries and to copy those libraries onto the new output file after the operations requested are complete.

9. END.

The newly created output file is a tape. To use this new system it is necessary to load this tape onto disk. See "Disk Load Program" for instructions.

EXAMPLE 1

Figure 4 illustrates the control cards needed to build a typical SGF.

The sample deck begins with the normal initialization information. The first card contains the bootstrap that loads the first record of the system into core storage. This is followed by the JOB card. ASGN cards assign symbolic units to specific input/output devices through their assignment symbols.

The MODE card indicates that the output from any compiler is to be written on the Go file, MGO. This same card indicates that the operations that follow are to be executed in SG mode. This sets internal indicators which are tested by dependent programs and which condition or alter their mode of operation.

The EXEQ AUTOCODER card contains the fourth operand (NOFLG) and the fifth operand (NOPCH). The NOFLG operand is a signal to Autocoder that the source statements that follow will knowingly violate the rules governing use of index registers; hence flags that would normally be a diagnostic warning should be suppressed. The NOPCH parameter will suppress the punch output from this compilation.

The first source card to Autocoder is a HEADR card, which serves to identify the run.

By comparing the sample cards with the detailed descriptions of the control cards that appear later in this publication, the input to Autocoder will be seen to indicate the following:

Unit record equipment will be available on channel 1.
Magnetic tape units will be available on two channels, two tapes per channel.
Nine disk files are defined on both channel 1 and channel 2.
The system will be a 1410 Data Processing System.
The core-storage size will be 80,000 positions.
The system will be disk oriented.
The system files will contain no tape labels.
There will be no Tele-Processing devices.
The Core Image file will not be available.
The POW program will not be included.
The Standard Print Unit will be a 1403 Printer.
The Standard Punch Unit will be a unit-record punch.
AIU capability will not be included.
The number of lines per page will be 55.
The console inquiry message area will consist of 20 positions of core storage.
JOB cards will not be punched.
All Monitor control cards are to be typed and printed.
The new system normally will be available in the disk area whose assignment symbol is D1.
The SIU will normally reference U1.
The SPR will reference U3.
The SPU will reference U2.
Ten reserve units will be established.
Ten work units will be established.
The IOCS will provide routines for unit-record equipment and 729 tape units on channel 1.
The IOCS will provide routines for 7330 (and 729) tape units on channel 2.
The IOCS will provide for one module of disk on both channel 1 and channel 2.
Write disk checks will be performed.
The last source statement to Autocoder is the END card.

The EXEQ SG1 card contains a 7 in column 59 to indicate the actual machine size.

```
00018¤%L¤F000066R%X00035¤%L¤F200066$%X000352%X00059¤%J00138 %00000000%¤ 1410B00T
     MON$$      DATE YYDDD
     MON$$      JOB  GENERATE DISK SGF
     MON$$      ASGN LIB,D2
     MON$$      ASGN MJB,D3
     MON$$      ASGN MGO,D4
     MON$$      ASGN MW1,D5
     MON$$      ASGN MW2,D6
     MON$$      ASGN MW3,D7
     MON$$      MODE GO,SG
     MON$$      EXEQ AUTOCODER,,,NOFLG,NOPCH
                HEADRGENERATE DISK SGF
                GEN01U3,U1,U2
                GEN02,1,A0,A1
                GEN02,2,B0,B1
                GEN03D1,00000000,2199,D2,00220000,2599,D3,00260000,2999,
                     D4,00300000,3399,D5,00340000,3799,D6,00380000,4199,
                     D7,00420000,4599,D8,00460000,4999,D0,00500000,5399
                GEN04F1,00000000,2199,F2,00220000,2599,F3,00260000,2999,
                     F4,00300000,3399,F5,00340000,3799,F6,00380000,4199,
                     F7,00420000,4599,F8,00460000,4999,F0,00500000,5399
                GEN0817900001l0,,55,20,099,D1,U1,,,U3,U2
                GEN0910
                GEN1010,D4,F1,D6,D5,F2
                GEN11
                DEVDF1,729,1402,1403
                DEVDF2,7330
                DSKDF1,00
                DSKDF2,00
                IOKDF1410,,,,,,,8
                END
     MON$$      ASGN MW2,A2
     MON$$      EXEQ SG1                                        7
                CREATDSYSTEM
                END
     MON$$      EXEQ LINKLOAD
                INPUTMW2
     MON$$      EXEQ SG2.                                      ,7
                LOCATM,MACROLIB
                INSERM
                LOCATC,CREATLIB
                INSERC
                LOCATR,IBMLIBR
                INSERR
                END
     MON$$      END
```

Figure 4. Control Cards Required for a Typical SGF for a Disk-Oriented System

The SG1 control cards begin with the CREAT DSYSTEM card. This card requests Create Library package DSYSTEM and produces control information for the Linkage Loader. The control information will be in the form of Linkage Loader control cards.

The SG1 control cards terminate with an END card.

The EXEQ LINKLOAD card is followed by the INPUT MW2 card. The INPUT card directs LINKLOAD to obtain its control information from the tape file MW2 prepared by SG1.

The EXEQ SG2 card contains an additional control punch:

COLUMN	CONTENTS	
59	7	Character indicates the actual machine size.

SG2 now produces a new output tape on tape file MW2. The order of the disk file, except for the position of the relocatable library, is not important in a disk-oriented system because of the random access capability of disk storage. The newly created output file is on tape unit MW2. To use this new system, it is necessary to load this tape onto the disk. (See "Disk Load Program" for instructions.)

Building an SOF

This operation is essentially a "copy" function. Each item to be copied must be specifically requested. Any item(s) not specifically requested will not appear on the output file.

Organization of the File

In Example 1, the programs required for the SOF run were converted into absolute format.

A consideration for constructing a disk SOF is to eliminate elements from the system so that less disk storage is required. Less disk area occupied by the system means that there will be more data area space available for production jobs.

Organization of the Control Deck for the SOF

The control deck for this operation is composed of the following sections:

1. Initialization, including the DATE card.
2. JOB.
3. ASGN cards that assign symbolic units to physical input/output devices.
4. MODE card describes the program operation wanted for the job.
5. EXEQ SG1 card causes the system to locate and load SG1. The cards that follow this EXEQ card must be Class III SG control cards. These control cards instruct SG1 to create a work file for the Linkage Loader.

NOTE: SG control cards, Class III, may be interspersed with (or replaced by) Linkage Loader control cards.

6. EXEQ LINKLOAD card causes the Linkage Loader to be located and loaded. This EXEQ card is followed by a control card which instructs the Linkage Loader to obtain its control information from the file just created by SG1.
7. EXEQ SG2 card causes SG2 to be located and loaded. The cards that follow this EXEQ card are divided into two distinct groups. The first group consists of Class I SG control cards only. The Class I control cards direct SG2 to locate the named elements and to copy them onto the new output file. The second group is made up of Class II, III, and IV SG control cards. (Class IV control cards must be last.) This group directs SG2 to perform some functions with the libraries and to copy those libraries onto the new output file after the function requested is complete.
8. END.

The newly created output file is a tape. In order to use this system it will be necessary to load this tape onto disk storage. (See "Disk Load Program" for instructions.)

EXAMPLE 2

Figure 5 is an example that illustrates the control cards needed to build a typical SOF. Inclusion of a user-written program in the SOF is shown.

The sample decks begin with standard initialization information. This is followed by the JOB card. The MODE card sets an internal indicator that is tested by the dependent programs that must alter their method of operation for System Generation mode.

The group of ASGN cards assigns the required files that are to be used for this job.

The EXEQ card for this run does not require machine size indication in column 59; it is assumed that the SGF reflects the actual machine size.

The control cards that follow the EXEQ SG1 card request SG1 to extract the control information from the Create Library packet named DFORTRAN, and to pass this information to the Linkage Loader via tape file MW2.

The EXEQ LINKLOAD is followed by the INPUT MW2 card. The INPUT card directs the Linkage Loader to obtain its control information from tape file MW2, as prepared by SG1. At the end of file on MW2, the Linkage Loader returns to the SIU and gets the control information to process the user-written program.

The first group of cards presented to SG2 are Class I control cards. They indicate to SG2 that the programs named are to be copied from the SGF to the new master tape file. After the three named programs are copied, SG2 will copy the FORTRAN and the user-written programs that were just placed on the Job file by the Linkage Loader.

The next group of cards directs SG2 to locate IBMLIBR, change its name to FORTRANLIB, and to delete from this library the named routines and those that exist between the given names. The new FORTRANLIB is then copied onto the new master tape.

```
*** INSERT BOOTSTRAP CARD ***
     MON$$      DATE YYDDD
     MON$$      JOB  CREATE DISK SOF ORIENTED TO USER PROGRAM AND FORTRAN
     MON$$      MODE SG
     MON$$      ASGN LIB,D2
     MON$$      ASGN MJB,D3
     MON$$      ASGN MW2,A1
     MON$$      EXEQ SG1
                CREATDFORTRAN
                END
     MON$$      EXEQ LINKLOAD
                INPUTMW2
                PHASEUSERNAME
     **** RELOCATABLE DECK FOR USER PROGRAM ***
     MON$$      EXEQ SG2
                INCLDIBSGDL
                INCLDIBBOOT
                INCLDLINKLOAD
                END
     FORTRANLIBLOCATR,IBMLIBR
     IBSRTCOMANDELETR,IBCBLDVZER
     IBRANDOM   DELETR,TPRDLIBGEN
                END
     MON$$      END
```

Figure 5. Control Cards Required for a Typical SOF for a Disk-Oriented System

When the END card is read, the new file is produced by SG2 and a message is typed stating the unit on which the output file, MW2, is located. See "Disk Load Program" for a description of how to load this new file onto the disk.

General Maintenance Considerations

Maintenance of the Operating System covers many possible variations. Listed below are some of the important aspects:

Change to Monitor: Requires complete regeneration of the SGF, SOF, all Job files that have been saved, and all TP Library files.

Change to a Dependent Program in the Operating Section: Requires recompilation of affected modules, copying (INCLD) any unaffected programs, and regeneration of affected programs.

Change to Library (other than Monitor library elements): Requires updating of library, plus regeneration of any programs in the operating section which were affected. As in above item, any unaffected programs can be copied by use of the INCLD card. By careful planning, the user should be able to make changes to an existing relocatable library and also incorporate those changes into a new operating section as part of one job. For this type of operation the reader should review the control card descriptions of the operation of the Go file during maintenance of the Relocatable Library. Refer to Class IV control cards INSER and REPLC, under "System Generation Control Cards."

A careful study of the control card descriptions is required to utilize the maintenance capabilities efficiently.

Check List for System Generation (Disk Oriented)

1. The programs in System Generation use the last (highest) core-storage position as a starting point from which certain elements are built.

2. The Sort Definition program should be generated by the initial generation if sort or merge programs are to be created on an SOF.

3. The user can modify the Macro Library and the Create Library, but cannot create additional libraries with records of the same format as these libraries. A Relocatable Library can also be modified. The library must be loaded onto the LIB file when the system is loaded on the disk.

4. COBOL and Autocoder use symbolic units MW1, MW2, and MW3 for work files during compilation; FORTRAN uses MW1 and MW2. MW1 and MW3 should be assigned to a different channel and/or module from MW2 for balanced and efficient usage of the 1301 disk.

5. The Create Library must be named CREATLIB, and the Macro Library must be named MACROLIB.

6. If the COBOL "ENTER" verb is used in conjunction with FORTRAN subprograms, the relocatable subprograms required to run with COBOL and FORTRAN object programs (refer to "Relocatable Library Contents") must be in the *same* relocatable library.

7. The order of elements on the disk is of little importance because of the random access nature of the device. *However, the placement of some of the elements on the output tape, which contains the system, can be critical, and the following points should be observed.*

   a. The first program on the tape must be IBSGDL. This is the Disk Load program.
   b. The second program must be IBBOOT. IBBOOT, for a disk-oriented system, comprises a bootstrap program (IBBOOT2D), the Resident Monitor, and the Transitional Monitor.
   c. The remaining programs may be in any order if they have been included from an existing SGF. If the system that is being built is to be capable of generating another system, IBSGDL must be included again.
   d. If an entire system is being generated, IBSGDL must be generated as the first program. Also, if the system being generated is to be capable of generating another system, then the IBSGDL program must also be generated last.

8. Table 2 indicates the ASGN cards that are required during System Generation.

9. The Generalized Tape Sorting program requires a minimum of four tape units. Additional tape units increase the program's efficiency. See the publication, *Generalized Tape Sorting Program.*

10. Each initialization of a disk system requires that the BOOT1 card be first in the SIU. The contents of this card are typed on the console printer during system loading. The operator key punches the card and places it in the SIU.

11. System Generation must be the last job(s) or only job(s) in a batch. Other batch processing cannot be performed until the system has been reinitialized.

Physicol Unit		1	2	3	4	5	6	7	8	9
Symbolic Unit		SOF	SIU	MW1	MW2	MW3	MJB	MGO	LIB	SPR
Program used in System Generation	Autocoder	Required	Required	Work File	Work File	Work File		Output		Optional
	SG1				*Linkoge Looder Input File			Held		
	SORT-DEFINE				*Linkage Loader Input File			Held		
	LINKLOAD				*Linkage Loader Input File		Output	Input	Input	
	SG2				*New SOF		Input	Possible Input	Input	

* Must be o tope unit.

Table 2. Disk System Input/Output Requirements

Organization of Data Files on Disk Storage

Prior to System Generation, organization of disk storage must be determined; assignment symbols for the physical units into which each disk storage module is divided must be selected, and the disk must be formatted. The Input/Output Control System for the IBM 1410/7010 Operating System provides for a number of methods of organizing a disk file.

Since almost all uses of the disk by system files require Form G (Partitioned Sequential-Geometric) disk files, this form is discussed here. For example, the SOF, compiler work files, the library, and the Go and Job files are Form G files. Also, one specific form of Form G is used for the IBM 1301 Disk Storage: a single 2,165-character record in Load mode.

Form G (Partitioned Sequential-Geometric) makes it possible for more than one logical file to share the storage area available on one or more cylinders; the record sizes of the different files need not be the same. This can appreciably reduce seek time.

Figure 6 depicts a use of Form G. The outside cylinder, cylinder 000, is assigned to work files MW7, MW8, and MW9 by the control cards shown below.

```
6          16      21
MON$$      ASGN    MW7,A1,A2
MON$$      ASGN    MW8,A3
MON$$      ASGN    MW9,A4,A5
```

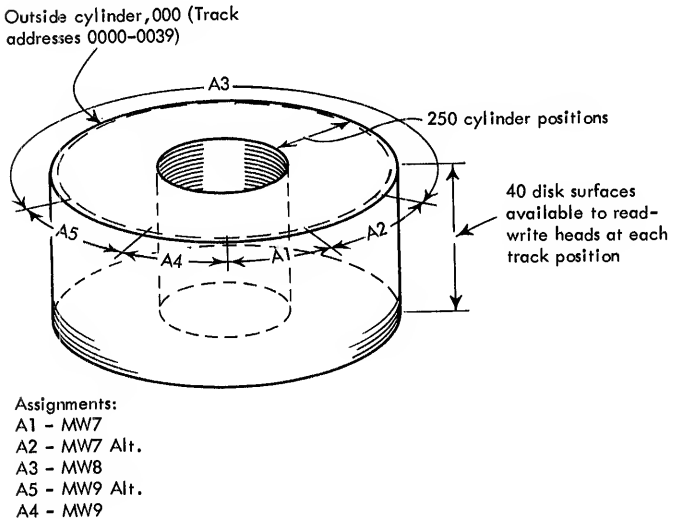
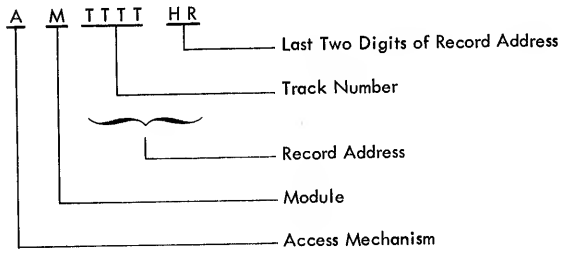


Figure 6. Example of a Disk Module Organized for Form G Files

The relation between the assignment symbols A1 through A5 and the physical units must have been established during System Generation (see the section, "System Description Control Cards"). During System Generation:

A1 was specified as 00000000 to 00003900
A2 was specified as 00000001 to 00003901
A3 was specified as 00000002 to 00003902
A4 was specified as 00000003 to 00003903
A5 was specified as 00000004 to 00003904

The Form G address format of these disk areas is:



For the example discussed here, access and module (AM) are assumed to be 00. In the Form G address format, as for all geometric disk addresses, the first four digits of the record address correspond to the track number. The only difference between these assignments is the last two characters, the HR identifier.

Each time the user issues a GET or PUT in his source program, the IOCS increments the TTTT section of the address. When end of physical unit is reached, the file is switched to the alternate unit, if one is assigned. (In the example, A2 and A5 are the alternate units for MW7 and MW9, respectively.)

Before this form of record addressing can be used to execute an object program:

1. The cylinder must be formatted to the desired scheme; and
2. During System Generation, the System Monitor must be informed of the addresses by use of macro-instructions GEN03, GEN04, GEN05, and GEN06 — discussed later in this manual.

To use this form of record addressing in a source program, the user must write the proper DTF and DA statements in his source program.

Relocatable Libraries

Control cards needed to build and maintain relocatable libraries for a tape-oriented system are discussed

first; control cards needed to build and maintain relocatable libraries for a disk-oriented system are then discussed.

Building a New Library as Part of a Tape SOF

During a System Generation run, the user may build additional relocatable libraries on the SOF.

For example, a new relocatable library can be added with the following cards subsequent to the EXEQ SG1 card:

```
          16        21
ADD       R,newname
```

(Follow ADD card with the relocatable subprograms of the library, *newname*. These cards must appear prior to the first END card.)

In addition, the user must specify the insertion point of the new library. (All relocatable libraries and the create packets of the Create Library require that the insertion point be specified.) The insertion point is specified by a PHASE card during an SGF run. During a maintenance run, the insertion point is specified by an INCLD card.

Figure 7 shows the *creation* of an additional library on the SGF; Figure 8 shows the *maintenance* of an additional library on the SOF. Control cards related to creation or maintenance of the additional library are indicated by ***.

Building a Library External to a Tape SOF

Instructions for creating and maintaining external relocatable tape libraries that are not a part of the SOF are given below. During this type of run, no other functions of System Generation may be used.

```
     MON$$     DATE YYDDD
     MON$$     JOB  ILLUSTRATE LIBRARY CREATION, GENERATE RUN
     MON$$     ASGN MJB,A1
     MON$$     ASGN MR0,A3
     MON$$     ASGN MW2,A5
     MON$$     ASGN MG0,B2
     MON$$     ASGN MW1,B4
     MON$$     ASGN MW3,B5
     MON$$     MODE GO,SG
     MON$$     EXEQ AUTOCODER,,,NOFLG,NOPCH
               HEADRGENERATE SGF
               GEN01U3,U1,U2
               GEN02/MDM/,1,A0,A1,A2,A3,A4,A5,A6,A7,A8,A9
               GEN02/MDM/,2,B0,B1,B2,B3,B4,B5,B6,B7,B8,B9
               GEN081700090119,,55,5,099,A0,U1,,,U3,U2,,,B6,SNAP
               GEN0910
               GEN1010,A4,B4,A5,B5,A6
               GEN11
               DEVDF1,729,1402,1403
               DEVDF2,729
               IOKDF1410,,,,,,,,,,70000
               END
     MON$$     EXEQ SG1                                    7
               LOCATC,CREATLIB
               INSERC
               LOCATR,IBMLIBR
               INSERR
***            ADD  R,NEWNAME
*** RELOCATABLE MODULES ***
               LOCATM,AUTOCODER
               INSERM
               END
               CREATTMONITOR
               CREATRESTART
               CREATSYSGEN3
               CREATTAUTOCODE
               CREATTLINKLOAD
               PHASEIBMLIBR                                R
***            PHASENEWNAME                                R
               CREATTSYSGEN1
               PHASECREATLIB                               C
               CREATTSYSGEN2
               CREATUTILITIES
               CREATTMACROPRT
               CREATTFORTRAN
               CREATTCOBOL
               END
     MON$$     EXEQ LINKLOAD
               INPUTMW2
     MON$$     EXEQ SG2                                  L7
     MON$$     END
```

Figure 7. Control Cards for the Addition of a User's Relocatable Library to the SGF of a Tape-Oriented System

```
     MON$$      DATE YYDDD
     MON$$      JOB  ILLUSTRATE LIBRARY MAINTENANCE, INCLD RUN
     MON$$      ASGN MW1,B4
     MON$$      ASGN MW2,A5
     MON$$      ASGN MJB,A1
     MON$$      ASGN MR0,A3
     MON$$      EXEQ SG1                                    7
                LOCATC,CREATLIB
                INSERC
                LOCATR,IBMLIBR
                INSERR
***             LOCATR,NEWNAME
*** INSER, REPLC, AND DELET CARDS FOLLOWED BY RELOCATABLE MODULES ***
                LOCATM,AUTOCODER
                INSERM
                END
                INCLDIBBOOT
                INCLDIBRESMON
                INCLDRESTART
                INCLDIBTRANSIT
                INCLDSG3
                INCLDAUTOCODER
                INCLDIBTRANSIT
                INCLDLINKLOAD
                INCLDIBTRANSIT
                INCLDIBMLIBR
***             INCLDNEWNAME
                INCLDSG1
                INCLDCREATLIB
                INCLDSG2
                INCLDUTILITIES
                INCLDMACROPRT
                INCLDIBTRANSIT
                INCLDFORTRAN
                INCLDCOBOL
                INCLDIBTRANSIT
                END
     MON$$      EXEQ SG2                                    7
     MON$$      END
```

Figure 8. Control Cards for Maintenance of a User's Relocatable Library on the SOF of a Tape-Oriented System

BUILDING AN INDEPENDENT TAPE LIBRARY

Control cards used to build an independent library are shown below. (Assignment symbols used in this example are those appearing under "IBM Master File—Tape-Oriented System.")

```
6              16      21
MON$$          JOB     BUILD LIBRARY
MON$$          ASGN    MW1,B4
MON$$          ASGN    MW2,A5
MON$$          ASGN    MR0,A3
MON$$          ASGN    MJB,A1
MON$$          EXEQ    SG1
               ADD     R,LIBNAME*
     (Relocatable subprograms to be included in
     Relocatable Library)
               END
MON$$          EXEQ    SG2                          S**
MON$$          END
```

*LIBNAME can be any name not exceeding ten characters.
**Column 57 contains any character.

Execution of SG1 and SG2 produces a library file on symbolic unit MW1 and a list of library subprogram names on the SPR. (Date of compilation of each subprogram also is shown.)

This library file can be used by:

1. Assigning symbolic unit LIB to an assignment symbol other than the one assigned to the SOF; and
2. Referencing the library name as the fourth parameter of the execute card for LINKLOAD.

Every reference to a library in the operation of Linkage Loader accesses the library file. The library name must be the same as the name specified in the EXEQ LINKLOAD card (fourth parameter).

MAINTAINING A TAPE LIBRARY

Control cards used to update a library are shown in the following example.

```
6              16      21
MON$$          JOB     MAINTAIN LIBRARY
MON$$          ASGN    MW1,B4
MON$$          ASGN    MR0,A3
MON$$          ASGN    MJB,A1
MON$$          ASGN    MW2,A5
MON$$          ASGN    LIB,B0
MON$$          EXEQ    SG1
               ALTLB   TAPE
MODULEC*       REPLC   R
     (New relocatable subprogram, MODULEC, that
     replaces old MODULEC)
MODULEN*       DELET   R
MODULEX        INSER   R
     (Relocatable subprogram, MODULEX)
               END
MON$$          EXEQ    SG2                          X**
MON$$          END
```

*Subprograms must be referenced in the sequence in which they appear on the tape library.
**Column 57 contains any character.

The execution of SG1 provides an updated library (LIB) on MW1, and the execution of SG2 provides a list of library subprogram names on the SPR. MODULEC is replaced with a new MODULEC; MODULEN is deleted; and MODULEX is inserted at the end of the library. Refer to "System Generation Control Cards" for the method of inserting a subprogram between existing subprograms of the library.

Disk Relocatable Library Considerations

All relocatable libraries are "external" libraries in the disk system. During the loading of a disk system (tape-to-disk), the relocatable library on the input tape must be loaded into the disk area to be assigned as LIB (instead of the SOF).

During a standard System Generation run, the one library (LIB) can be copied onto the tape that contains the new system. If complete regeneration capabilities are to be preserved, this library must contain all library subprograms supplied on the Master file.

Instructions for creating and maintaining a disk library are given below.

BUILDING A DISK LIBRARY

Control cards used to build a new disk library are shown below. (Assignment symbols used in this example are those appearing under "IBM Master File — Disk-Oriented System.")

```
6           16      21
MON$$       JOB     BUILD D LIBRARY
MON$$       ASGN    MW2,A1*
MON$$       EXEQ    SG2                          X**
            ADD     R,LIBNAME***
        (Relocatable subprograms to be included in
        Relocatable Library)
            END
MON$$       END
```

*A1 must be a tape unit.
**Column 57 contains any character.
***LIBNAME can be any name not exceeding ten characters.

The new library is produced on tape unit MW2. To use this new library, it must be loaded onto the disk in the area assigned as LIB. The program DSKLIBLDR is used to perform this function, as described under "Disk Load Programs."

Maintaining a Disk Library

The four general situations for which a disk relocatable library can be maintained are:

1. The library on disk (LIB) to be updated and written onto tape unit MW2; MW2 to contain only the library material.
2. The library-only tape (created by a previous run) to be updated and written onto tape unit MW2; MW2 to contain only the library material.
3. The library on disk (LIB) to be updated and written onto tape unit MW2 following the disk system SOF or SGF.
4. The library-only tape (created by a previous run) to be updated and written onto tape unit MW2 following the disk system SOF or SGF.

All maintenance of relocatable libraries produces tape output. This tape must be loaded onto the disk in the area assigned to LIB to make the library available to dependent programs. (Refer to "Disk Load Programs.")

Figures 9 and 10, respectively, illustrate the control cards required to provide maintenance for the first two situations listed above.

The third situation is illustrated in Figure 5.

For the fourth situation listed above, two changes must be made in the control cards shown in Figure 5: the LOCAT card is replaced with an ALTLB TAPE card; and an ASGN card is added, immediately preceding the EXEQ SG2 card, to assign LIB to a tape unit.

```
MON$$       JOB  NO. 1, UPDATE LIB ONLY, DISK TO TAPE
MON$$       ASGN LIB,D4
MON$$       ASGN MW2,A1              TO A TAPE UNIT
                (NOTE PUNCH IN COL. 57 OF NEXT CARD)
MON$$       EXEQ SG2                                  X
            LOCATR,LIBNAME
***INSER,   REPLC, DELET CARDS AND RELOCATABLE MODULES***
            END
MON$$       END
```

Figure 9. Control Cards to Update a Disk Library Onto a Library-Only Tape

```
MON$$       JOB  NO. 2, UPDATE LIB ONLY, TAPE TO TAPE
MON$$       ASGN LIB,B1              TO A TAPE UNIT
MON$$       ASGN MW2,A1
                (NOTE PUNCH IN COL. 57 OF NEXT CARD)
MON$$       EXEQ SG2                                  X
            ALTLBTAPE
***INSER,   REPLC, DELET CARDS AND RELOCATABLE MODULES***
            END
MON$$       END
```

Figure 10. Control Cards to Update a Library-Only Tape Onto a New Library-Only Tape

Sort Definition Program

The Sort Definition program (SORTDEFINE) must be an absolute program on an SOF or SGF, if sort programs are to be incorporated onto an SOF. The Sort Definition program is incorporated onto an SGF automatically when the CREAT cards TSYSTEM or DSYSTEM are used to create the SGF. An alternative to this is the use of the CREAT card TSRTDEFIN. Details appear under "Contents of the Libraries," and "Creation Charts."

The absolute SORTDEFINE program is copied from an SGF to an SOF by inserting the card INCLD SORTDEFINE into the deck, which is illustrated in the section "Building an SOF," under "Basic Concepts." The INCLD SORTDEFINE card copies the Sort Definition program during maintenance of an SOF.

Sort programs are incorporated onto an SOF using an operation similar to that discussed under "General Maintenance Considerations" of "Basic Concepts — Tape-Oriented System." The control cards for execution of the Sort Definition program are explained in the publication, *Generalized Tape Sorting Program.* Any set of sort definition control cards described in the referenced publication is acceptable, including those required for a modified sort program.

Figure 11 illustrates the incorporation of a single sort program onto an SOF.

Building Monitors with Tele-Processing Capabilities

The Tele-Processing Supervisor becomes a part of the Resident Monitor through System Generation. To permit inclusion of the Supervisor at the proper point in the Resident Monitor, special Create Library packets can be used. These packets aid in building a tape- or disk-oriented Monitor for either a standard configuration or a TP Only configuration.

Basically, there is a create packet that precedes the Supervisor call cards, and another create packet that follows them. The pairs of packets are:

TMONTP1 TMONTP2	These packets create a standard tape Monitor with Tele-Processing capabilities.
DMONTP1 DMONTP2	These packets create a standard disk Monitor with Tele-Processing capabilities.
TMONTPONLY TMONTPONL2	These packets create a tape Monitor for TP Only applications.
DMONTPONLY DMONTPONL2	These packets create a disk Monitor for TP Only applications.

The rules governing the calling of the various modules to make up a TP complex, as well as the names and functions of each module, appear in the publication, *Tele-Processing Supervisor.*

```
MON$$     DATE YYDDD
MON$$     JOB  ILLUSTRATE SORTDEFINE
MON$$     ASGN MJB,A1
MON$$     ASGN MR0,A3
MON$$     ASGN MW2,A5
MON$$     ASGN MW1,B4
MON$$     ASGN MW3,B5
MON$$     MODE SG
MON$$     EXEQ SG1
          LOCATC,CREATLIB
          INSERC
          LOCATR,IBMLIBR
          INSERR
          LOCATM,AUTOCODER
          INSERM
          END
          INCLDIBBOOT
          INCLDIBRESMON
          INCLDIBTRANSIT
          INCLDAUTOCODER
          INCLDSORTDEFINE
          INCLDLINKLOAD
          INCLDIBMLIBR
          END
MON$$     EXEQ SORTDEFINE
SORTEXMPLEDSORTSORT,FIXED,MULTIPLE,UNMODIF
          DUNITMW1,MW2,MW3
MON$$     EXEQ LINKLOAD
          INPUTMW2
MON$$     EXEQ SG1
          INCLDSG1
          INCLDCREATLIB
          INCLDSG2
          END
MON$$     EXEQ SG2
MON$$     END
```

Figure 11. Control Cards to incorporate a Single Sort Program Onto an SOF

Figure 12 is an example for building a standard tape Monitor for a Tele-Processing system using the IBM 1014.

Figure 13 is an example for building a standard disk Monitor for a Tele-Processing system with Programmed Transmission Control (PTC).

Figure 14 is an example for building a tape TP Only Monitor for a Tele-Processing system with IBM 1009 and 1014.

Figure 15 is an example for building a disk TP Only Monitor for a Tele-Processing system with IBM 1009, 1014, and Programmed Transmission Control.

Each example indicates where the user is to insert his Executive. This can be done in one of three ways:

1. The user can insert the relocatable object deck at the place indicated in the examples.

2. The user may have included the Executive in the relocatable library and can call it with a CALLN card.

3. The user may insert his Autocoder source deck after the TPDIR macro and have the object deck placed on the Go file. This module can then be called with a CALLN card at the appropriate time.

NOTE: The TPDIR macro is explained in the publication, *Tele-Processing Supervisor.*

Random-Processing Scheduler

One of the relocatable subprograms (IBRANDOM1) required by the Random-Processing Scheduler must be compiled by each user. The following steps indicate the method of generating the subprogram and incorporating it into IBMLIBR:

1. The user includes the GENRM macro (see "System Description Control Cards") in his deck when generating the SGF. This produces IBRANDOM1, the relocatable subprogram, written on the Go file.

2. The user then requests that IBRANDOM1 be incorporated into the Relocatable Library by placing the following card into the deck following the LOCAT R,IBMLIBR card:

```
6              16      21
IBRANDOM1 INSER  R,IBRANDOM2
```

If no other maintenance is to be performed on the library, this is the only card required. Refer to Class IV control cards (under "System Generation Control Cards") if other maintenance is to be done.

```
MON$$     DATE YRDAY
MON$$     JOB  GENERATE TP TAPE SYSTEM
MON$$     ASGN MR0,A3
MON$$     ASGN MJB,B3
MON$$     ASGN MG0,B2
MON$$     ASGN MW1,A4
MON$$     ASGN MW2,A5
MON$$     ASGN MW3,B4
MON$$     MODE GO,SG
MON$$     EXEQ AUTOCODER,,,NOFLG,NOPCH
          HEADRGENERATE TP TAPE SYSTEM
          GEN01U3,U1,U2
          GEN02/MDM/,1,A0,A1,A2,A3,A4,A5,A6,A7
          GEN02/MDM/,2,B0,B1,B2,B3,B4,B5,B6,B7
          GEN081700990110,4000,55,20,099,A0,U1,,,U3,U2,,,B6,SNAP
          GEN0910
          GEN1010,A4,B4,A5,B5,A6
          GEN11
          DEVDF1,729,1402,1403,,TP
          DEVDF2,729
          IOKDF1410,,,,,,,,,70000
          TPDIR30,10
          END
MON$$     EXEQ SG1
          LOCATR,IBMLIBR
          INSERR
          END
          CREATTMONTP1
          CALLNTPSTARTCH1
          CALLNTP1014CH10
          CALLNTPENDCH1
          CALLNTPTAPELDRA
          CALLNTPSUPER
                         USER INSERTS THE EXECUTIVE HERE
          CREATTMONTP2
          CREATTLINKLOAD
          PHASEIBMLIBR                                  R
          END
MON$$     EXEQ LINKLOAD
          INPUTMW2
MON$$     EXEQ SG2
MON$$     END
```

Figure 12. Control Cards for a Tape-Oriented Monitor for a Tele-Processing System with IBM 1014

Macro Print Program

The Macro Print program (MACROPRT), under the direction of control cards supplied by the user, writes selected information from the Macro Library onto the Standard Print Unit. This information can consist of any or all of the following items:

1. The identifier (GET, GEN01, etc.) of each macro routine, and its relative location in the library.
2. The contents of a macro routine.
3. The page and line number of every reference to *L characters* in model statements. L characters are the one-character labels appearing in column 6 of the Library Coding Form. This type of information is referred to in this discussion as "cross referencing."

The Create Library packets needed to build this program for a tape- or disk-oriented system appear under "Creation Charts."

System Requirements

MACROPRT is not run during System Generation; it requires a standard job run. The requirements for running the program are:

1. MACROPRT must have been placed on the SOF during System Generation; and
2. The Standard Print Unit must have been specified as part of the system at System Generation.

PRINT Card

Only the PRINT control card, other than the EXEQ card, is needed to run MACROPRT. The card may be repeated. The PRINT card has the following format.

```
*** INSERT BOOTSTRAP CARD ***
     MON$$      DATE YRDAY
     MON$$      JOB  GENERATE DISK SYSTEM WITH TP
     MON$$      ASGN LIB,D2
     MON$$      ASGN MJB,D3
     MON$$      ASGN MGO,D4
     MON$$      ASGN MW1,D5
     MON$$      ASGN MW2,D6
     MON$$      ASGN MW3,D7
     MON$$      MODE GO,SG
     MON$$      EXEQ AUTOCODER,,,NOFLG,NOPCH
                HEADRGENERATE DISK SOF WITH TP
                GEN01U3,U1,U2
                GEN02,1,A0,A1
                GEN02,2,B0,B1
                GEN03D1,00000000,2199,D2,00220000,2599,D3,00260000,2999,
                     D4,00300000,3399,D5,00340000,3799,D6,00380000,4199,
                     D7,00420000,4599,D8,00460000,4999,D0,00500000,5399
                GEN04F1,00000000,2199,F2,00220000,2599,F3,00260000,2999,
                     F4,00300000,3399,F5,00340000,3799,F6,00380000,4199,
                     F7,00420000,4599,F8,00460000,4999,F0,00500000,5399
                GEN081790990110,4000,55,20,099,D1,U1,,,U3,U2,,,,SNAP
                GEN0910
                GEN1010,D4,F1,D6,D5,F2
                GEN11
                DEVDF1,729,1402,1403,,,PTC
                DEVDF2,729
                DSKDF1,00
                DSKDF2,00
                IOKDF1410,,,,,,,8
                TPDIR30,10
                END
     MON$$      ASGN MW2,A2
     MON$$      EXEQ SG1
                CREATDMONTP1
                CALLNTPPTCCH1
                CALLNTPSUPER
                CALLNTPDISKLDRA
                                USER INSERTS THE EXECUTIVE HERE
                CREATDMONTP2
                CREATDLINKLOAD
                END
     MON$$      EXEQ LINKLOAD
                INPUTMW2
     MON$$      EXEQ SG2
                LOCATR,IBMLIBR
                INSERR
                END
     MON$$      END
```

Figure 13. Control Cards for a Disk-Oriented Monitor with Programmed Transmission Control TP Capability

CARD COLUMN	CONTENTS	EXPLANATION
1-5	blank	Not used
6-11	HEADER	Make entry if the program is to list the name of each macro routine; otherwise entry is blank. (This entry should appear only on the first card of the control package.)
12-15	blank	Not used
16-20	PRINT	Identifies this card type
21-72		The information in this field defines which macro routines are to be completely printed, and whether or not cross referencing is to be made. The field may be left blank only if the name of each macro routine is to be printed. The first parameter to be entered is left-justified in column 21. If more than one parameter is placed in this field, each parameter must be separated by a comma. No blanks may appear in or between parameters.
	CROSS	CROSS, if entered, must be the first parameter. It directs the program to cross reference L characters in model statements.
	ALL	ALL must be either the first or second (if CROSS is used) parameter if *all* macro routines in the Macro Library are to be listed.
		NOTE: When this entry is used, the program will assume that there are no other entries in the operand.
		If the ALL entry is not used, macro routines for which information is desired *must* be specified in the sequence in which they reside on the library. Refer to "Macro Library Contents" for the sequence of the Macro Library. Examples of the specification of the macro routines to be included in the SPR-produced listing are given below.
	START-*name8*	All macro routines from the beginning of the library up to and including *name8* will be listed.
	name7	Only *name7* will be listed.
	name4-name6	All macro routines starting with *name4* and up to and including *name6* will be listed (*name6* must physically follow *name4* in the library).
	name3-END	All macro routines starting with *name3* and continuing through the end of the library will be listed.

NOTE: Because of the above parameter definitions, no macro instruction can have the names CROSS, ALL, START, or END.

```
MON$$    DATE YRDAY
MON$$    JOB  GENERATE TP ONLY TAPE SYSTEM
MON$$    ASGN MRO,A3
MON$$    ASGN MJB,B3
MON$$    ASGN MGO,B2
MON$$    ASGN MW1,A4
MON$$    ASGN MW2,A5
MON$$    ASGN MW3,B4
MON$$    MODE GO,SG
MON$$    EXEQ AUTOCODER,,,,NOFLG,NOPCH,NOPRT
         HEADRGENERATE TP ONLY TAPE SYSTEM
         GEN01U3,U1,U2
         GEN02/MDM/,1,A0,A1,A2,A3,A4,A5,A6,A7
         GEN02/MDM/,2,B0,B1,B2,B3,B4,B5,B6,B7
         GEN0817009901l0,4000,55,20,099,A0,U1,,,U3,U2,,,B6,SNAP,
              TPONLY
         GEN0910
         GEN1010,A4,B4,A5,B5,A6
         GEN11
         DEVDF1,729,1402,1403,,TP
         DEVDF2,729
         IOKDF1410,,,,,,,,,70000
         TPDIR30,10
         END
MON$$    EXEQ SG1
         LOCATR,IBMLIBR
         INSERR
         END
         CREATTMONTPONLY
         CALLNTPSTARTCH1
         CALLNTP1009CH1
         CALLNTP1014CH10
         CALLNTPENDCH1
                        USER INSERTS THE EXECUTIVE HERE
         CALLNTPDIRECTRY
         CALLNTPTAPELDRA
         CALLNTPSUPERTPO
         CREATTMONTPONL2
         CREATTLINKLOAD
         PHASEIBMLIBR                                    R
         END
MON$$    EXEQ LINKLOAD
         INPUTMW2
MON$$    EXEQ SG2
MON$$    END
```

Figure 14. Control Cards for a Tape-Oriented TP Only Monitor

EXAMPLES

Print the name of each macro routine only:

```
6           16
HEADER      PRINT
```

Print the name and contents of each macro routine:

```
6           16      21
HEADER      PRINT   ALL
```

Print the name, contents, and cross refcrcnce for each macro routine:

```
6           16      21
HEADER      PRINT   CROSS,ALL
```

Print the contents of selected macro routines, from the beginning of the library through MACRA; skipping to and printing MACRC; skipping to MACRF; printing from MACRF to MACRH; skipping to MACRN; and printing from MACRN to the end of the library, cross referencing each macro routine selected:

```
            16      21
            PRINT   CROSS,START-MACRA,
                    MACRC,MACRF-MACRH,
                                MACRN-END
```

```
*** INSERT BOOTSTRAP CARD ***
     MON$$      DATE YRDAY
     MON$$      JOB  GENERATE DISK SYSTEM WITH TP ONLY
     MON$$      ASGN LIB,D2
     MON$$      ASGN MJB,D3
     MON$$      ASGN MGO,D4
     MON$$      ASGN MW1,D5
     MON$$      ASGN MW2,D6
     MON$$      ASGN MW3,D7
     MON$$      MODE GO,SG
     MON$$      EXEQ AUTOCODER,,,NOFLG,NOPCH
                HEADRGENERATE DISK SOF WITH TP
                GEN01U3,U1,U2
                GEN02,1,A0,A1
                GEN02,2,B0,B1
                GEN03D1,00000000,2199,D2,00220000,2599,D3,00260000,2999,
                     D4,00300000,3399,D5,00340000,3799,D6,00380000,4199,
                     D7,00420000,4599,D8,00460000,4999,D0,00500000,5399
                GEN04F1,00000000,2199,F2,00220000,2599,F3,00260000,2999,
                     F4,00300000,3399,F5,00340000,3799,F6,00380000,4199,
                     F7,00420000,4599,F8,00460000,4999,F0,00500000,5399
                GEN0817909901l0,4000,55,20,099,D1,U1,,,U3,U2,,,,SNAP,
                     TPONLY
                GEN0910
                GEN1010,D4,F1,D6,D5,F2
                GEN11
                DEVDF1,729,1402,1403,,TP,PTC
                DEVDF2,729
                DSKDF1,00
                DSKDF2,00
                IOKDF1410,,,,,,,8
                TPDIR30,10
                END
     MON$$      ASGN MW2,A2
     MON$$      EXEQ SG1
                CREATDMONTPONLY
                CALLNTPPTCCH1
                CALLNTPSTARTCH1
                CALLNTP1009CH1
                CALLNTP1014CH10
                CALLNTPENDCH1
                                USER INSERTS THE EXECUTIVE HERE
                CALLNTPDIRECTRY
                CALLNTPDISKLDRA
                CALLNTPSUPERTPO
                CREATDMONTPONL2
                CREATDLINKLOAD
                END
     MON$$      EXEQ LINKLOAD
                INPUTMW2
     MON$$      EXEQ SG2
                LOCATR,IBMLIBR
                INSERR
                END
     MON$$      END
```

Figure 15. Control Cards for a Disk-Oriented TP Only Monitor

Data Flow During System Generation Runs

This section is optional (but recommended) background reading that provides an over-all correlation between the files operated upon and the data flow required to generate a system.

This section graphically depicts the tape layout for the Master file, a typical SGF, and a typical SOF. Most of the section summarizes over-all data flow for the System Generation of a tape- or disk-oriented system.

Tape Layout

Figure 16(A) depicts the Master file. It shows the operating section and the three libraries.

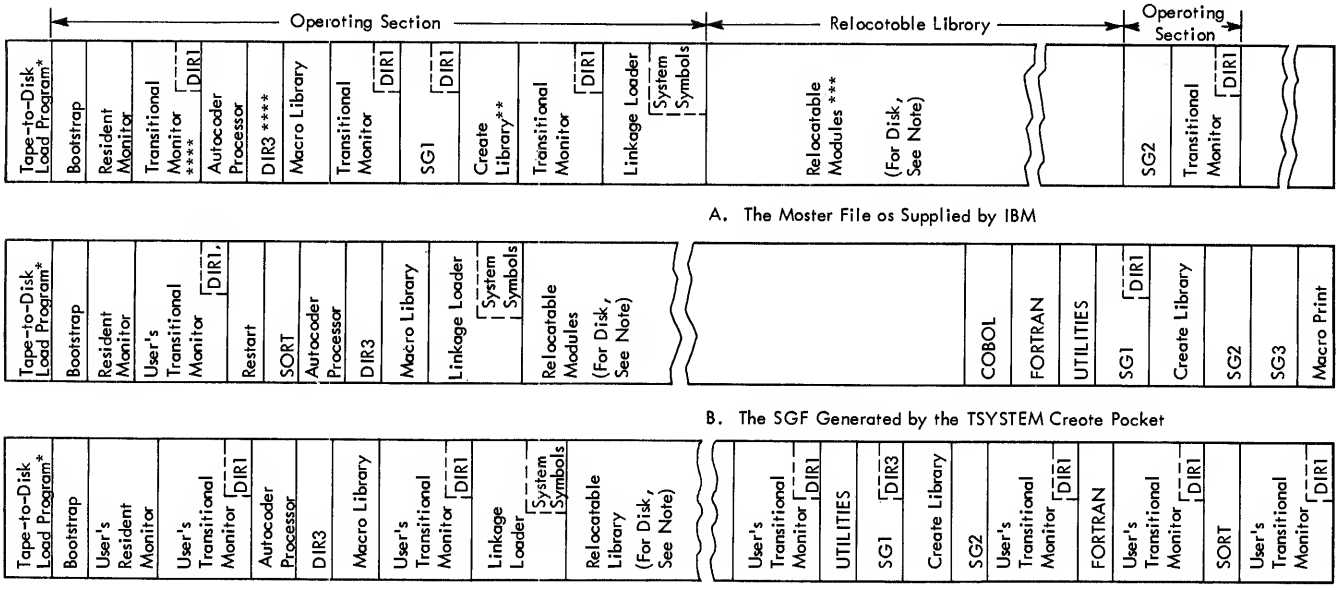
Figure 16(B) is a typical SGF layout. This reel of tape serves as the "Master file" for a particular installation. The operating section of the SGF consists of a System Monitor tailored to the specific machine environment of the installation, and those programs required for System Generation.

The three types of libraries on the Master file may be transferred to the SGF. During this process the user may add to, delete from, and modify the libraries.

Figure 16(C) is a typical SOF layout. The System Monitor of the SOF may be copied from the SGF or generated for specific features. The rest of the SOF consists of programs in absolute format and any library subprograms that the user has transferred from the SGF, or has constructed.

Over-All Data Flow — Tape System

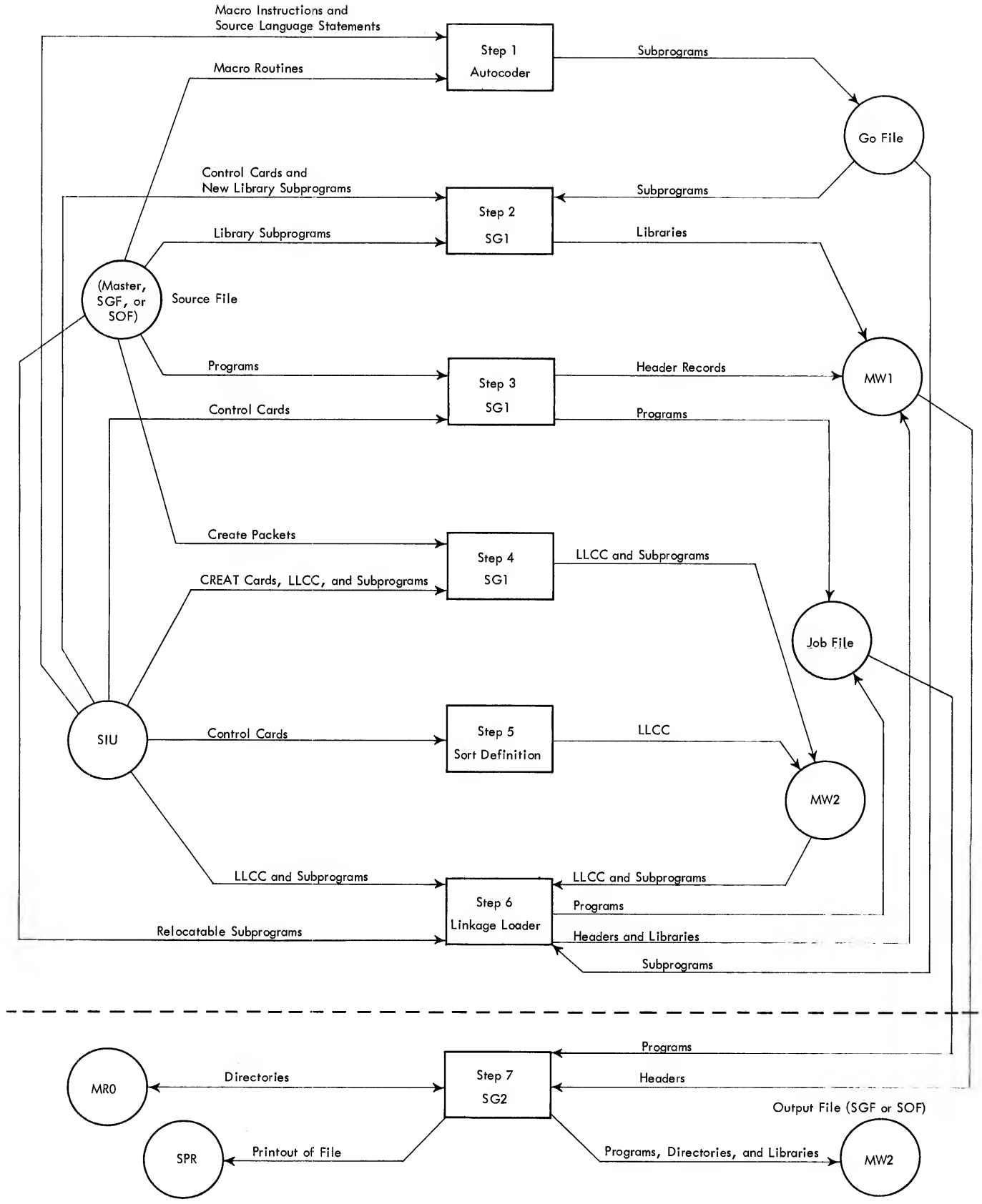
Figure 17 shows over-all potential data flow for the System Generation of a tape-oriented system. All of the capabilities are not necessarily used in a typical Sys-



* For a disk-oriented file only.
** Refer to "Creation Chorts".
*** Refer to "Relocotoble Library Contents".
**** DIR1 is the directory of phose nomes.
DIR3 is the Mocro Library directory.

NOTE: For disk version, Relocotoble Library must be lost item on tope. Multiple Tronsitionol Monitors ore not needed on the SOF.

Figure 16. The System Files



NOTE: LLCC = Linkage Loader Control Cards

Figure 17. Steps in the Generation of a Tape System

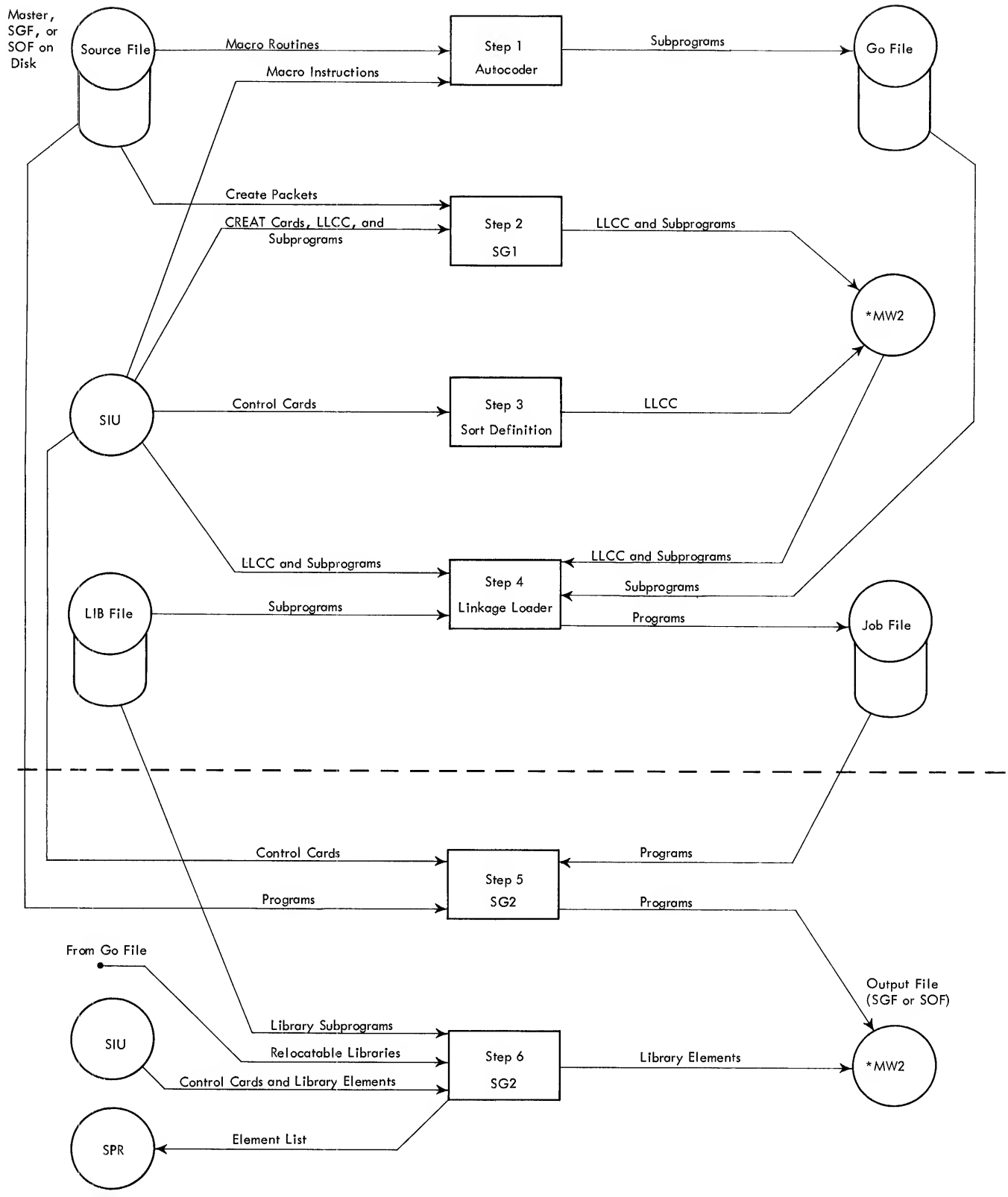
tem Generation. The source file shown in the figure may be a Master file, SGF, or SOF. Each major step in the figure is explained below.

STEP	PROGRAM BEING EXECUTED	ACTION PERFORMED
1	AUTOCODER	Autocoder produces relocatable subprograms on the Go file.
2	SG1	SG1 copies and/or updates libraries from the source file. New libraries also may be created. Input is from the SIU or, in the case of relocatable libraries, may also come from the Go file. Output consists of libraries on MW1.
3	SG1	SG1 copies existing programs from the source file onto the Job file. A header for each program copied is written on MW1. If any library is to be placed onto the output tape, only a header indicating the location for the library is written on the Job file and MW1.
4	SG1	SG1 transfers Linkage Loader control cards from the Create Library onto MW2. SG1 also places on MW2 any Linkage Loader control cards or subprograms encountered in the SIU.
5	SORTDEFINE	This program generates Linkage Loader control cards, from its input parameters, onto MW2.
6	LINKLOAD	Linkage Loader converts relocatable subprograms into absolute programs and places them on the Job file. Control card input may come from the SIU or MW2. Relocatable input may come from a relocatable library on the source file, the Go file, the SIU, and/or MW2. Linkage Loader also produces a header on MW1 for each phase it produces on the Job file.
	NOTE: Step 2, if used, must be performed only once during a System Generation run. Steps 3, 4, 5, and 6 may be performed any number of times, and in any sequence desired. The order of the new SGF or SOF (see step 7) is determined solely by the order of the elements on the Job file.	
7	SG2	SG2 must be the last program executed in any System Generation run. It performs two major functions. It first scans MW1. MW1 contains all libraries and a header for every phase of each program on the Job file. From this information, it produces two directories and writes them on MR0. If the Standard Print Unit is available in the system, this step also lists the names and order of the subprograms of each library, and the names and order of each program of the SGF or the new SOF. The second function is to copy the Job file to MW2, which contains the SGF or the new SOF. As it copies, it inserts directories from MR0 and libraries from MW1 when there are requesting headers. It also provides blocked, absolute-format records.

Over-All Data Flow — Disk System

Figure 18 shows over-all potential data flow for the System Generation of a disk-oriented system. All of the capabilities are not necessarily used in a typical System Generation. The source file shown in the figure may be a Master file, SGF, or SOF, that has been loaded onto disk storage. Each major step in the figure is explained below.

STEP	PROGRAM BEING EXECUTED	ACTION PERFORMED
1	AUTOCODER	Autocoder produces relocatable subprograms on the Go file. NOTE: MW2 *must* be assigned to an area on the disk.
2	SG1	SG1 transfers Linkage Loader control cards from the Create Library onto MW2. SG1 also places on MW2 any Linkage Loader control cards or subprograms encountered in the SIU. NOTE: MW2 *must* be a tape file during this and remaining operations.
3	SORTDEFINE	This program generates Linkage Loader control cards, from its input parameters, onto MW2.
4	LINKLOAD	The Linkage Loader converts relocatable subprograms into absolute programs and places them on the Job file. Control card input may come from the SIU or MW2. Relocatable input may come from a relocatable library (LIB), the Go file, the SIU, and/or MW2.
	NOTE: Steps 2, 3, and 4 may be performed any number of times and in any sequence desired.	
5	SG2	SG2 copies existing programs from the source file and the Job file onto the new output tape.
6	SG2	SG2 copies and/or updates libraries. New libraries may also be created. Input is from the SIU or, in the case of relocatable libraries, may also come from the Go file. If the Standard Print Unit is available in the system, this step also lists the names and order of the subprograms of each library and the names and order of each program of the new SGF or the new SOF.



NOTES: *Must be a tape file
LLCC = Linkage Loader Control Cards

Figure 18. Steps in the Generation of a Disk System

This section contains the control cards that define the type of system desired by the user. The cards are source statements to the Autocoder processor. Autocoder, through its macro-instruction facilities, uses the statements to select the modules required to create the desired Monitor and Resident IOCS.

The following Autocoder rules apply to the format of these macro statements:

1. The macro name is written in columns 16-20 (left-justified).
2. The parameters (operands) are written beginning in column 21.
3. The parameters are separated by commas.
4. Blanks are not permissible within a parameter.
5. Omitted parameters must be indicated by writing the comma that would have followed the parameter. (This rule does not apply if the omitted parameter would have been the last on the card.)

The macro statements should be sequenced by the user in the order in which they are described in this section. The GEN11 macro is required whether or not Tele-Processing capabilities are desired with the system.

Physical Unit Definitions

Unit-Record Devices (GEN01)

The GEN01 macro statement is used to declare the unit-record devices available to the system and to give each of them an assignment symbol. An assignment symbol (ss) can be any two alphameric characters unique (within the system) to the device it is identifying.

PARAMETER	CONTENTS	EXPLANATION
		Channel 1 Assignment Symbols (ss)
1	ss	1403 Printer
2	ss	Card Reader
3	ss	Card Punch
		Channel 2 Assignment Symbols
4	ss	1403 Printer
5	ss	Card Reader
6	ss	Card Punch
		Channel 1 Paper Tape Reader Assignment Symbol
7	ss	Paper Tape Reader
		Channel 2 Paper Tape Reader Assignment Symbol
8	ss	Paper Tape Reader

The following statement could be used to describe a system with a 1403 Printer and 1402 Card Read Punch on channel 1, and an 1101 Paper Tape Reader on channel 2:

```
          16      21
GEN01     U1,U2,U3 , , , , , PT
```

Tape Units (GEN02)

The GEN02 macro statement is used to declare the tape units available to the system. A separate GEN02 statement must be made for each channel.

PARAMETER	CONTENTS	EXPLANATION
1	/MDM/	Use this parameter if the system will include the Core Image file (see GEN08). If included, this parameter must be used in the GEN02 statement for each channel. This parameter must be specified if Checkpoint and/or the Storage Print utility program are desired.
2	c	Channel number for the units declared in this statement.
3	ss	Assignment symbol for unit 0 in the channel specified in parameter 2 of this statement.
4-12	ss, (etc.)	Assignment symbols for units 1 through 9 on the channel specified in parameter 2 of this statement. (No skipping of unit numbers is permitted – that is, "ss,,ss" is an invalid entry.)

The following statements could be used to declare a Core Image file, five tape units on channel 1, five on channel 2, and three on channel 3:

```
          16      21
GEN02     /MDM/,1,A0,A1,A2,A3,A4
GEN02     /MDM/,2,B0,B1,B2,B3,B4
GEN02     /MDM/,3,C0,C1,C2
```

Disk Areas (GEN03-GEN06)

The macro statements GEN03 through GEN06 are used to define physical units in disk storage. The four macros apply, respectively, to disk modules on channels 1 through 4. The information given below is applicable to all four macros; the only distinction between them is the channel identification established by the macro name.

PARAMETER	CONTENTS	EXPLANATION
1	ss	Assignment symbol for the area defined by the next two parameters
2	amtttthr	a – access mechanism m – module number tttt – starting track address hr – two-digit identifier of the track (HA2) or of the appropriate record area on the track
3	eeee	Ending track address
4-45	ss, amtttthr, eeee, (etc.)	The pattern of parameters 1-3 is repeated for each disk area defined within the module(s) on this channel. Three areas can be defined *per card*; fifteen areas can be defined *per macro statement* (see below).

SPECIAL CONSIDERATIONS

1. Each of these macro statements (GEN03-GEN06) can consist of one card containing the macro name in columns 16-21, immediately followed by one through four *continuation cards.* (Continuation cards differ only in that columns 16-21 are left blank.) Since three areas can be defined *per card,* fifteen areas can be defined *per macro statement.* If more that fifteen areas are to be defined in the modules on a particular channel, then the macro statement for that channel must be repeated. For example, if twenty areas are to be defined in modules 0 and 1 on channel 2, two GEN04 macro statements are required. (The first would consist of five cards defining fifteen areas, and the second would consist of two cards defining the other five areas.)

2. Although each area defined must be entirely contained within one module, there is no restriction against defining, by one macro statement, areas within different modules.

3. Autocoder can process a maximum of thirty-three GEN01 through GEN06 macro statements. This factor should be considered in determining whether to begin a new macro statement or to use continuation cards for definition of disk areas. (Only cards with a macro name in columns 16-21 count toward the limit of thirty-three.)

EXAMPLE

The following statements could be used to define four areas in module 0 on channel 1, two areas in module 1 on channel 1, and two areas in module 0 on channel 4:

```
                16          21
GEN03           DA,001543AA,1943,DB,
                002700BA,3150,DC,003543AA,
                3943DD,004700BA,5150,EA,
                010000AA,5000,EB,010000BB,
                                        5000
GEN06           FA,005000AA,7500,FB,005000
                                     BB,7500
```

Monitor Definitions (GEN08)

The GEN08 macro statement is used to specify system information that affects the construction of the Monitor.

PARAMETER	CONTENTS	EXPLANATION
1	dcfltmwpra	d — *Data Processing System* 1 1410 7 7010 c — *Core-Storage Size* (highest address of the machine) 3 39999 5 59999 7 79999 9 99999 f — *SOF Residence* 0 Tape 9 Disk l — *System File Tape Labels* 0 No labels 1 Standard 80-character labels 2 Standard 120-character labels t — *Tele-Processing Supervisor* 0 Monitor does not include the Tele-Processing Supervisor. 9 Monitor does include the Tele-Processing Supervisor. m — *Core Image File* 0 System does not include Core Image File. 9 System does include Core Image File. w — *POW Program* 0 Not included 9 POW program included for Standard Print and/or Standard Punch Units. (A description of the POW program is in *Operator's Guide,* Form C28-0351.) p — *Standard Print Unit* 0 None 1 1403 Printer 2 Tape unit r — *Standard Punch Unit* 0 None 1 Unit-record punch 2 Tape unit a — *Alternate Input Unit* 0 None 9 AIU capability is included.
2	nnnnn	*Tele-Processing System; Area Reserved* nnnnn — Number of core-storage positions to be reserved permanently for TP programs. (If no area is reserved, this parameter is omitted.)
3	nn	*Lines-Per-Page* Number to be stored in Resident Monitor's Communication Region at /LIN/. If specified, this must be a two-digit entry.
4	n or nn	*Console Input Area* This parameter specifies the number of core-storage positions to be reserved in the Resident Monitor as the console input area: 5-20. For Tele-Processing systems, the parameter 20 will be assigned automatically, and this parameter can be omitted.
5	jmt	*Control Card Recording* j — *JOB Card Punching* 0 JOB cards are *not* to be recorded on the Standard Punch Unit. 9 JOB cards *are* to be recorded on the Standard Punch Unit. m — *Monitor Control Cards — Standard Print Unit* 0 Monitor control cards are *not* to be recorded on the Standard Print Unit.

PARAMETER	CONTENTS	EXPLANATION
		9 All Monitor control cards *are* to be recorded on the Standard Print Unit.
		t – *Monitor Control Cards-Console*
		0 Monitor control cards are *not* to be recorded on the console printer.
		9 All Monitor control cards *are* to be recorded on the console printer.
		NOTE: It is recommended that all Monitor control cards be recorded on the console printer so that diagnostic messages can be readily associated with the error conditions.
6-14		*Assignment Symbols (See Note)*
6	ss	System Operating file (required)
7	ss	Standard Input Unit (required)
8	ss	Alternate Input Unit (optional)
9	ss	System Library file (optional)
10	ss	Standard Print Unit (optional)
11	ss	Standard Punch Unit (optional)
12	ss	TP Library file (optional)
13	ss	Temporary Storage file (optional)
14	ss	Core Image file (optional)

NOTE: Parameters 10, 11, and 14 are classified as optional; however, if these system files are included, and if they are not assigned by this macro statement, ASGN cards for these files must precede the first JOB card during initialization of the system.

Parameters 8, 9, 12, and 13 are also classified as optional; these files, if included at the installation, may be assigned during initialization or any time prior to their use by the system. Furthermore, 12 and 13 must be assigned before the TP complex is opened.

15	SNAP	Use this parameter if the Snapshot capability is to be included in the Resident Monitor for unusual end of program. (Dependent program unusual-end-of-program situations will cause a Snapshot of all of core storage.) Otherwise, omit the parameter.
16	TPONLY	Use this parameter for an Operating System that is to be used as a Tele-Processing system *only*. Otherwise omit the parameter.

Symbolic Unit Definitions

Reserve Units (GEN09)

The GEN09 macro statement specifies the *number* of reserve units whose names are to be included in the Monitor's assignment tables. The names will be assigned to the reserve units sequentially, first numerically and then alphabetically. (That is, MR0, MR1, . . . MR9, MRA, MRB, . . . MRZ.)

PARAMETER	CONTENTS	EXPLANATION
1	n or nn	*Number* of reserve units: 1-36. (Note that the number "7" makes available symbolic units and names MR0 through MR6, *not* MR7.)

Work Units (GEN10)

The GEN10 macro statement specifies the *number* of work units whose names are to be included in the Monitor's assignment tables. The names will be assigned to the work units sequentially, first numerically and then alphabetically. (That is, MW0, MW1, . . . MW9, MWA, MWB, . . . MWZ.)

PARAMETER	CONTENTS	EXPLANATION
1	n or nn	*Number* of work units: 1-36
2-37	ss, (etc.)	*Assignment Symbols:* Entries in parameters 2-37 are optional. If made, they serve the same functions as an ASGN card. Assignment symbols will be supplied to work units as follows: MW0 parameter 2 MW1 parameter 3 MW2 parameter 4 etc.

Tele-Processing System Units (GEN11)

The GEN11 macro statement is used to specify the *number* of Tele-Processing system units to be included in the Monitor's assignment tables. The names of these units will be assigned sequentially, first numerically and then alphabetically. (That is, MT0, MT1, . . . MT9, MTA, MTB, . . . MTZ.)

NOTE: This macro statement must always be made. For installations not including a TP system, the operand field must be blank.

PARAMETER	CONTENTS	EXPLANATION
1	n or nn	*Number* of Tele-Processing system units: 1-36
2-37	ss, (etc.)	*Assignment Symbols:* Entries in parameters 2-37 are optional. If made, they serve the same functions as an ASGN card. Assignment symbols will be applied to the Tele-Processing system units as follows: MT0 parameter 2 MT1 parameter 3 MT2 parameter 4 etc.

Device Definitions for the Resident IOCS (DEVDF)

The DEVDF macro statement defines the channel orientation of the input/output devices included in the system (except for disk units, which are described by the DSKDF macro, discussed next). One macro statement is to be made for each channel.

PARAMETER	CONTENTS	EXPLANATION
1	1, 2, 3, or 4	*Channel number* of devices described in this card (one macro per card). A separate macro statement is used for each channel.

PARAMETER	CONTENTS	EXPLANATION
2		*Tape Unit Type*
	729	If 729 magnetic tape units are the *only* type of tape unit attached to this channel.
	7330	If one or more of the tape units attached to this channel is an IBM 7330.
3	1402 or 1442	*Card Reader/Punch* If an IBM 1402 Card Read Punch or 1442 Card Reader is attached to this channel, if any.
4	1403	*Printer* If an IBM 1403 Printer is attached to this channel.
5	1011	*Paper Tape Reader* If an IBM 1011 Paper Tape Reader is attached to this channel.
6	TP	*Tele-Processing Devices* If an IBM 1009, an IBM 1014, or a telegraph device is attached to this channel.
7	PTC	If a PTC unit is attached to this channel.

The following statements would be used to describe a system that has 729 tape units, a 1402 Card Read Punch, and a 1403 Printer on channel 1, telegraph devices and 7330 tape units on channel 2, and a mixture of 729 and 7330 tape units on channel 3:

```
16      21
DEVDF   1,729,1402,1403
DEVDF   2,7330
DEVDF   3,7330 , , , , TP
```

Disk Definitions for Resident IOCS (DSKDF)

The DSKDF macro statement is used to specify the number and channel orientation of the disk modules available to the system. (Another function of this macro is discussed under the explanation of parameters 3-21.) One statement is to be made for each channel to which disk modules are attached.

PARAMETER	CONTENTS	EXPLANATION
1	1, 2, 3, or 4	*Channel number* for modules on this card.
2	00	*Access-Mechanism/Module* The entry in parameter must be for access mechanism 0, module 0.
3-21	am	The entries in parameters 3-21 may be in any order. The following should be considered in determining the order: during the execution of object programs, the IOCS will, for each channel, determine the availability of an access-mechanism/module combination before issuing a Seek Disk or any other disk input/output instruction. The order in which the availability is tested is the order in which the parameters appear in parameters 2-21. Thus, "00" is always tested first, next the combination in parameter 3, and so on.

The following statements could be used for a system with four modules of disk storage on channel 2, and two modules on channel 3:

```
16      21
DSKDF   2,00,01,02,03
DSKDF   3,00,01
```

IOCS Definitions (IOKDF)

The IOKDF macro statement is used to specify the inclusion of certain IOCS routines to meet the requirements of the system's dependent programs. This macro statement must immediately follow the DEVDF and DSKDF macro statements.

PARAMETER	CONTENTS	EXPLANATION
1	1410 or 7010	*Machine type*
2		*80-Character Tape Label Routines*
	A	No exits will be used by dependent programs.
	B	Exits A, D, G, and N, and return points /LRC/, /LRF/, /LRM/, and /LRR/ will be used by dependent programs. Reading, writing, and checking functions are not to be provided by the IOCS.
	C	All exits *except* C, F, J, L, and Q, and all return points *except* /LRB/, /LRE/, /LRH/, /LRK/, and /LRP/, will be used by dependent programs. Reading and writing, but *not* checking, functions are to be provided by the IOCS.
	D	All 80-character label routines are to be provided by the IOCS.
3	A, B, C, or D	*120-Character Tape Label Routines* (As for parameter 2.) If operand of C is given, 120-character label is read – but the following tape mark is not spaced over. NOTE: If both 80-character and 120-character label routines are to be included in the IOCS, then parameters 2 and 3 must specify the same code letter.
4	4	*Error statistics* are to be accumulated by the IOCS.
5	5	*Service routines* will be included in dependent programs. That is, the DTF INTADDR entry will be used.
6	,	(This parameter available for system expansion; currently, it is to be omitted.)
7	7	*Disk files* requiring specification of operands 2 and/or 3 of the DTF FILEFORM entry will be used by dependent programs.
8	8	*Write Disk Checks* are to be taken. That is, the WDC operand will be used in the DTF ERRCHECK entry.
9	,	(Omitted – as with parameter 6.)
10	xxxxx	*Checkpoint functions* will be required by dependent programs. The third record of each checkpoint triplet is to begin at location xxxxx. (This address will be stored in the Resident Monitor's Communication Region at /OGR/.) This address must be provided if the

PARAMETER	CONTENTS	EXPLANATION
		IOCS checkpoint facilities and/or the Storage Print utility program are to be used. (Refer to GEN02 and GEN08 macros.) It is recommended that location xxxxx be about 8,000 positions below the top of core storage.

SPECIAL CONSIDERATIONS FOR SYSTEM FILE LABELS

If the user specifies in the GEN08 macro statement that system files are to have tape labels, then parameter 2 or 3 must be specified in this macro to provide the IOCS routines for those labels. Furthermore, only "A" or "D" may be used in those parameters.

Random-Processing Disk Module Definitions (GENRM)

The GENRM macro statement defines the disk modules that are to be made available for random processing. (Continuation cards may be used for this macro statement, if necessary.)

PARAMETER	CONTENTS	EXPLANATION
1-40	ccm, ccm, (etc.)	"c" is the channel character of the appropriate x-control fields. (As shown, this must appear twice.) "m" is the identifying module number (0-9). NOTE: The GENRM macro may be compiled by a separate Autocoder run. The resultant relocatable module must be combined as part of a program and loaded through the SIU. It is recommended that IBRANDOM1, which results from GENRM, be placed in the Relocatable Library between the modules IBRANDOM and IBRANDOM2; however, it *may* be located wherever the user wishes.

This section contains descriptions of the control cards that are used to direct the System Generation process. The control cards for programs that are unique to the System Generation function are described completely. The control cards for programs that are used for data processing as well as for System Generation and that are, therefore, documented in other publications, are described in this publication solely from the viewpoint of System Generation.

Monitor Control Cards

In addition to the functions and entries described in the publication, *System Monitor*, the Monitor EXEQ card can have the following entries that are unique for System Generation:

1. In the EXEQ card for SG1 (MON$$ EXEQ SG1),

CARD COLUMN	CONTENTS	EXPLANATION
59	3, 5, 7, or 9	Indicates that the actual machine size being used for System Generation is other than that specified in the Monitor (at /AMS/) of the source file. This is intended primarily to specify, *for the initial System Generation,* that the machine has more than 40,000 positions. 3 – 40K 5 – 60K 7 – 80K 9 – 100K

2. In the EXEQ card for SG2 (MON$$ EXEQ SG2):

CARD COLUMN	CONTENTS	EXPLANATION
57	any character	Any character, except blank, indicates to SG2 *that* SG1 *only updated an alternate relocatable library* and that the printed output of SG2 is to consist solely of names of the relocatable library modules. If this column is blank, the SG2 printout will be a full listing of the SOF (or SGF) generated. (Italicized words above apply only to a tape-oriented system.)
58	any character	Largest possible records are to be built. If this column is blank, the blocking factor for absolute-format programs is 2,165. Note that any entry in this field, except blank, will override any specification given in the first PHASE card of a program. See the following description of the additional entries that can be made in the Linkage Loader PHASE card. This column is not used for a disk-oriented system.
59	3, 5, 7, or 9	This must be the same as that punched in column 59 of the EXEQ SG1 card described above.
60		Tape labels on the new SOF (applicable only to tape-oriented systems):
	blank	No labels
	1	80-character labels
	2	120-character labels
		NOTE: If tape labels are used, this EXEQ card must be immediately followed by a card specifying the information to be used in writing those labels: 1 6 80 1HDR (label information) The label information must conform to the IOCS standard label format. The field "File Identification" must contain IBMSYSTEMb. Refer to the publication, *Basic Input/Output Control System.* (For 120-character labels, SG2 adds a 40-position blank field to the 80 characters taken from the card.) This card is used only once: when changing to system file labels from a system that does not use file labels.

Linkage Loader Control Cards

In addition to the functions and entries described in the publication, *System Monitor*, the Linkage Loader PHASE card may have the following entries that are unique to System Generation:

CARD COLUMN	CONTENTS	EXPLANATION
61	1 or 3	This entry indicates that a directory is to be inserted at this point. If the entry is "1", the Major Phase Directory (Directory 1) is inserted. If the entry is "3", the Macro Library Directory (Directory 3) is inserted. NOTE: The one Directory 1 request permitted for a disk system is reserved for the Transitional Monitor.
62	M, R, or C	This entry indicates that the Macro Library, a Relocatable Library, or the Create Library is to be inserted at this point. ("R" applies only to a tape-oriented system.)
63	any character	If this column is not blank, the absolute format records are "largest possible." If the column is blank, then the size is 2,165 characters per record. ("Largest possible" refers to tape-oriented systems only.)

SG Control Cards

The remainder of this section describes the control cards used to perform library maintenance functions with the SG1 and SG2 programs. These cards (hereafter termed *SG control cards)* are divided into four classes, in accordance with the type of library for which they are used. (Class I is an exception, in that the one card in this class applies to all three library types.)

In the following material the term SGFX refers to the file from which the System Generation is being performed — which can be the Master file, an SGF, or an SOF. The term SGFY refers to the new file being created by the System Generation — which can be either an SGF or an SOF.

Tables are provided at the end of this section to show the grouping of the SG control cards for presentation to SG1 and SG2, and to summarize the library maintenance functions and control card formats.

NOTE: *No SG control card may contain any punches in columns 1-5.*

Class I — The INCLD Card

This card directs the System Generation programs to copy an entire program or library from SGFX to SGFY.

```
16      21
INCLD   name
```

The INCLD card has two functions. The specific function performed is determined by the nature of the element named in the operand.

If *name* is the identifier of an *absolute format program* on the System Generation source file (SGFX), the INCLD card directs the System Generator to copy the program onto either the Job file for a tape system or the output unit for a disk system.

If *name* is the identifier of a Create or Relocatable Library on the SGFX, the INCLD card directs the System Generator to insert the library at this point on the SGFY. The library must have been previously referenced by a LOCAT card, and updated or copied. The placement of the Macro Library on the SGFY is contingent on the placement of the Autocoder processor. If the SGFY is disk-oriented, the Macro Library will be placed at the end of the absolute section.

For example, to simply copy Autocoder from the SGFX to the SGFY, the following card would be used:

```
16      21
INCLD   AUTOCODER
```

Class II Control Cards — Macro Library

Class II control cards pertain to all functions concerning the Macro Library.

LOCAT Control Card (Class II)

A LOCAT control card must be used to locate the Macro Library before a library maintenance function may be performed. This card must appear before any group of INSER, REPLC or DELET control cards that pertain to the Macro Library.

Columns 1 through 5 of the macro cards must be punched and these cards must be in ascending order.

There are two forms of this card that pertain to the Macro Library:

```
16      21
LOCAT   M,AUTOCODER
16      21
LOCAT   M,MACROLIB
```

The first card is used to locate the Macro Library on a tape-oriented SGFX. The second card is used to locate the Macro Library on a disk-oriented SGFX.

INSER Control Card (Class II)

The INSER card directs the System Generator to perform maintenance on the total Macro Library or on some given macro.

Format 1

```
16      21
INSER   M
```

This format of the INSER card directs the System Generator to copy the entire Macro Library onto either MW1 for a tape system or the output unit for a disk system. This card must be preceded by the LOCAT card.

Format 2

```
6           16      21
alpha       INSER   M
```

This format of the INSER card directs the System Generator to copy to the end of the Macro Library and to insert the library element *alpha* at the end of the library. The new element must follow the INSER card in the SIU.

Format 3

```
6           16      21
name        INSER   M,aaaaa
```

This format of the INSER card directs the System Generator to insert new statements after the statement with sequence number *aaaaa* in macro *name.*

The new statements must follow the INSER card in the SIU. The statements of macro *name* are not resequenced.

REPLC Control Card (Class II)

Format 1

```
6           16      21
name        REPLC   M
```

This format of the REPLC card directs the System Generator to replace macro *name* with a new element

of the same name. The element must follow the REPLC card in the SIU.

Format 2

```
6           16      21
name        REPLC   M,aaaaa,bbbbb
```

This format of the REPLC card directs the System Generator to delete from macro *name* the statements with sequence numbers *aaaaa* through *bbbbb*, and to replace these with new statements. The new statements must follow the REPLC card in the SIU. The statements of macro *name* are not resequenced by the System Generator. To replace a single statement, *aaaaa* is equal to *bbbbb*.

The DELET Control Card (Class II)

Format 1

```
6           16      21
name        DELET   M
```

This format of the DELET card directs the System Generator to delete the element *name* from the Macro Library.

Format 2

```
6           16      21
name        DELET   M,aaaaa,bbbbb
```

This format of the DELET card directs the System Generator to delete statements *aaaaa* through *bbbbb* from macro *name*. To delete a single statement, *aaaaa* can equal *bbbbb*. No resequencing is performed by the System Generator.

Class III Control Cards — Create Library

The Class III control cards direct the System Generator to perform operations on the Create Library.

The Create Library is a collection of Linkage Loader control card packets. Each packet has a name by which it can be *called*. When it is called, normally through the CREAT control card, the System Generator extracts the named packet from the library and places its contents on MW2. MW2 must always be a tape unit, and the Linkage Loader must be informed that a Create package has been selected. The user gives this information to the Linkage Loader via the INPUT control card.

LOCAT Control Card (Class III)

A LOCAT card must be used to locate the Create Library before the library maintenance functions may be performed. This card must appear before any group of INSER, REPLC, DELET or GENER packets that pertain to the Create Library.

There is one form of the LOCAT control card as it pertains to the Create Library:

```
16      21
LOCAT   C,CREATLIB
```

INSER Control Card (Class III)

The INSER card directs the System Generator to perform maintenance functions on the total Create Library, or on some given Create packet.

Format 1

```
16      21
INSER   C
```

This format of the INSER card directs the System Generator to copy the entire Create Library onto either MW1 for a tape system or the output unit for a disk system. The Create Library must be located by a LOCAT card immediately preceding the INSER card.

Format 2

```
6           16      21
name        INSER   C
```

This format of the INSER card directs the System Generator to copy to the end of the Create Library, and to insert the library element identified by *name* at the end of the library.

GENER Control Card (Class III)

Each packet in the Create Library is identified by a header label of the format shown below:

```
16      21
GENER   name
```

Name is the identifying name of the packet (maximum of 10 characters).

When format 2 of the INSER card or format 1 of the REPLC card is used, it must be followed by a GENER control card.

The GENER control card must, in turn, be followed by the packet of Linkage Loader control cards.

To use this packet as Linkage Loader input during a generation run, the user must use a CREAT card with the same name as was given on the GENER card.

REPLC Control Card (Class III)

Format 1

```
6           16      21
name        REPLC   C
```

This format of the REPLC card directs the System Generator to replace the Create packet *name* with a new packet having the same name. The REPLC card must be followed, in the SIU, by a GENER card, and then the packet.

DELET Control Card (Class III)

Format 1

```
6           16      21
name        DELET   C
```

This format of the DELET card directs the System Generator to delete the packet *name* from the Create Library.

CREAT Control Card (Class III)

The CREAT card directs SG1 to access the Create Library (CREATLIB) for Create packet *name*, to deblock the records of this packet into card-image records, and to transfer these card-image records to work file MW2, for later input to the Linkage Loader. The format is as follows:

```
16      21
CREAT   name
```

NOTE 1: MW2 must be a tape unit.

NOTE 2: Linkage Loader must be presented with an INPUT MW2 control card.

NOTE 3: See section, "Creation Charts," for a detailed listing of all Create packets supplied by IBM.

NOTE 4: Linkage Loader control cards or object decks may be intermixed with CREAT control cards and will be placed on MW2 in the order in which they are received. This allows the user to merge his own programs into sequence with IBM programs. Other means are also provided for reordering an SGF once the programs have been placed on the file in absolute format. See "INCLD Control Card (Class I)."

Class IV Control Cards — Relocatable Library

Class IV control cards direct the System Generator to perform operations on a Relocatable Library.

LOCAT Control Card (Class IV)

The LOCAT card must be used to locate a particular library on the system file (SGF or SOF) before the library maintenance functions can be performed.

Format 1

```
16      21
LOCAT   R,name1
```

Referring to format 1, *name* identifies the library. *Name* must be left-justified in the operand field, and can consist of a maximum of ten characters.

Format 2: The LOCAT card can also be used to change the name of a relocatable library:

```
6           16      21
name2       LOCAT   R,name1
```

Name1 is the original name; *name2* is the new name.

ALTLB Control Card (Class IV)

The ALTLB card is used to locate the Relocatable Library currently assigned as the System Library file (LIB). This card performs the same functions for such Relocatable Libraries as does the LOCAT card for any type of library residing on the system file (SGF or SOF).

NOTE: If any Relocatable Library, except those residing on the SOF (or SGF), is to be maintained, that library must be assigned to symbolic unit LIB. *Furthermore, maintenance of this library is the only function that can be performed during this System Generation run.* Also, see discussion of column 57, EXEQ SG2 control card, under "Monitor Control Cards."

Format 1

```
16      21
ALTLB   xxxx
```

Referring to format 1, the operand *xxxx* specifies the type of physical unit assigned to LIB; this operand can be "TAPE" or "1301".

ADD Control Card (Class IV)

The ADD card directs the System Generator to create header information for a new library. The ADD card must immediately precede, in the SIU, the records that constitute the new library.

```
16      21
ADD     R,name
```

Name is the identifying name that the new library is to have (maximum of ten characters).

INSER Control Card (Class IV)

Format 1

```
16      21
INSER   R
```

This format of the INSER card directs the System Generator to copy an entire Relocatable Library onto either MW1 for a tape system or the output unit for a disk system. The library that is copied must be located by a LOCAT (or ALTLB) card immediately preceding the INSER card.

Format 2

```
6           16      21
name        INSER   R
```

This format of the INSER card directs the System Generator to copy to the end of the Relocatable Library being processed, and to insert the module (subprogram) *name* at the end of the library. The module can either follow the INSER card in the SIU or be on the Go file. If this format INSER card is not followed by the module (that is, if the next card in the SIU is another control card), the System Generator automatically searches the Go file for module *name*.

Format 3

```
6           16      21
name1       INSER   R,name2
```

This format of the INSER card directs the System Generator to insert module *name1* in front of module *name2*. If module *name1* does not follow the INSER card in the SIU, the Go file is searched. If more than one module *(from the* SIU) is to be inserted at this point, they may follow the module packet for *name1*, without additional INSER cards.

REPLC Control Card (Class IV)

Format 1

```
6               16      21
name            REPLC   R
```

This format of the REPLC card directs the System Generator to replace library element *name* with a new element having the same name. The module can either follow the REPLC card in the SIU or be on the Go file. If this format REPLC card is not followed by the module (that is, if the next card in the SIU is another control card), the System Generator automatically searches the Go file for the module.

Format 2

```
6               16      21
name1           REPLC   R,name2
```

This format of the REPLC card directs the System Generator to delete modules *name1* through *name2*, and to replace the deleted modules with a single module whose identifier is *name1*. Note that one or more modules can be deleted but only one new module with *name1* can be added. If the new module *name1* does not follow the INSER card in the SIU, the Go file is automatically searched.

DELET Control Card (Class IV)

Format 1

```
6               16      21
name            DELET   R
```

This format of the DELET card directs the System Generator to delete module *name* from the Relocatable Library.

Format 2

```
6               16      21
name1           DELET   R,name2
```

This format of the DELET card directs the System Generator to delete modules *name1* through *name2*.

Groups of Control Card Classes

The four classes of SG control cards must be presented to SG1 and/or SG2 in certain groups. The order and contents of these groups are determined, in part, by the orientation of the system file being used — whether it is tape- or disk-oriented. The table below defines the groups into which the various classes of SG control cards must be divided for proper control of the SG1 and SG2 programs.

	TAPE	DISK
SG1	Group 1 Classes II, III, IV	Group 1 Class III*
	Group 2 Classes I, III*	Group 2 None
SG2	Group 1 None	Group 1 Class 1
	Group 2 None	Group 2 Classes II, III, IV**

* Of Closs III cards, only the CREAT cord may be used in this group. Linkage Loader control cards moy be intermixed with the CREAT cards.

** The Class IV cards must be last in this group.

Each group must have the following card as its last card:

```
16
END
```

SUMMARY OF LIBRARY MAINTENANCE: FUNCTIONS AND CONTROL CARDS

Library Maintenonce Function	Operation 16-20 LOCAT		Operation 16-20 ADD		Operotion 16-20 INSER		Operotian 16-20 REPLC		Operotion 16-20 DELET	
	6-15 Lobel	21-72 Operond	6-15 Lobel	21-72 Operand	6-15 Label	21-72 Operond	6-15 Lobel	21-72 Operond	6-15 Lobel	21-72 Operond
Add on entire library				1 4						
Delete an entire library		(Omission of control-cord reference to a library couses its deletian.)								
Change nome of o Relocotoble Library	13	2 12								
Copy af o library (no change)		1 4				1				
Add an element to end of o library		1 4			5	1				
Add o module to middle of o library		2 4			5	2 6				
Reploce element from SIU		1 4					5	1		
Replace madule from Go File		2 4					5	2		
Delete o library element		1 4							5	1
Delete consecutive modules		2 4							7	2 8
Reploce severol modules with one from SIU		2 4					10	2 11		
Mointoin externol Relacotable Library		(Locote with ALTLB cord. Maintoin with SG cards os far library an System File.)								
Add stotements to o mocro		3 4			5	3 9				
Delete stotement from a macro		3 4							5	3 10 11
Reploce mocro stotements		3 4					5	3 10 11		

Key
1. M,R, or C (library type)
2. R only
3. M only
4. Library nome
5. Element nome
6. Nome of module before which new module will be inserted
7. First module to be deleted
8. Lost module to be deleted
9. Number of statement behind which new stotements will be inserted
10. First element to be deleted or reploced
11. Lost element to be deleted or replaced
12. Original nome
13. New nome

This section lists: (1) the assignment symbols that must be used by each user for his initial System Generation run, (2) the programs available on the Master file, and (3) the construction of the basic Resident Monitor. This section applies only to a tape-oriented system and need not be read by persons interested in a disk-oriented system.

Assignment Symbols for Initial Run

Arbitrary assignment symbols have been chosen for use in the Master file. Therefore, the first run made by each user *must* be made on the basis of these assignment symbols. For the initial run, MON$$ ASGN cards must be prepared. These cards assign physical units to those duties specified under "Basic Concepts — Tape-Oriented System."

The symbols available for assignment to the physical units for the initial System Generation run are listed as follows:

PHYSICAL UNIT	CHANNEL 1 ASSIGNMENT SYMBOLS	CHANNEL 2 ASSIGNMENT SYMBOLS
Card Reader	*R1	R2
Printer**	P1	P2
Punch	None	None
Tape (729 or 7330)	A0	B0
	A1	B1
	A2	B2
	A3	B3
	A4	B4
	A5	B5

*R1 is assigned as the SIU, but the unit assigned as SIU can be changed from the console. A0 is assigned as the SOF, but the unit assigned as SOF can be changed from the console.

**Although assignment symbols are given for the printer, the print routine is not included in the basic Resident Monitor used during the initial run. The user may include the routine by means of the first and tenth parameters of GEN08. See the first example of "Examples of System Generation for a Tape System."

Programs Available

The programs available on the Master file for a tape-oriented system are:

IBBOOT	Bootstrap
IBRESMON	Resident Monitor, including IOCS
IBTRANSIT	Transitional Monitor
AUTOCODER	Processor and Macro Library
IBTRANSIT	Additional Copy
SG1	System Generation Program, Part 1
CREATLIB	Create Library
IBTRANSIT	Additional Copy
LINKLOAD	Linkage Loader
IBMLIBR	Relocatable Library
SG2	System Generation Program, Part 2
IBTRANSIT	Additional Copy

Basic Resident Monitor

The basic Resident Monitor on the Master file has the following design.

System: 1410 System with 40,000 positions of core storage

With:
1. Five-position console input area
2. Console printing of all Monitor control cards
3. Two channel, tape and unit-record IOCS
4. Error statistics

Without:
1. Labeling
2. Tele-Processing
3. Restart
4. Memory Dump file (MDM)
5. Standard Print routine
6. Standard Punch routine
7. AIU routine
8. POW
9. User-written service routines
10. Snapshot at unusual end of program

Symbolic units requiring assignment are: MGO, MJB, MW1, MW2, MW3, and MR0.

Control cards used to generate the Master file are shown in Figure 19.

```
MON$$    DATE YRDAY
MON$$    JOB  CREATE TAPE MASTER FILE
MON$$    ASGN MGO,A1
MON$$    ASGN MR0,A1
MON$$    ASGN MJB,A2
MON$$    ASGN MW3,A2
MON$$    ASGN MW2,A3
MON$$    ASGN MW1,A4
MON$$    MODE GO,SG
MON$$    EXEQ AUTOCODER,,,NOFLG,NOPCH
         HEADRCREATE TAPE MASTER
         GEN01P1,R1,,P2,R2
         GEN02,1,A0,A1,A2,A3,A4,A5
         GEN02,2,B0,B1,B2,B3,B4,B5
         GEN081300000000,,55,5,009,A0,R1
         GEN091
         GEN104
         GEN11
         DEVDF1,7330,1402,1403
         DEVDF2,7330,1402,1403
         IOKDF1410,,,4
         END
MON$$    EXEQ SG1
         LOCATC,CREATLIB
         INSERC
         LOCATR,IBMLIBR
         INSERR
         LOCATM,AUTOCODER
         INSERM
         END
         CREATTMONITOR
         CREATTAUTOCODE
         CREATTSYSGEN1
         PHASECREATLIB                                    C
         CREATTLINKLOAD
         PHASEIBMLIBR                                     R
         CREATTSYSGEN2
         END
MON$$    EXEQ LINKLOAD
         INPUTMW2
MON$$    EXEQ SG2
MON$$    END
```

Figure 19. Control Cards that Generated the Master File for a Tape-Oriented System

This section lists: (1) the assignment symbols and disk addresses that must be used by each user for his initial System Generation run, (2) the programs available on the Master file, and (3) the construction of the basic Resident Monitor. This section applies only to a disk-oriented system and need not be read by persons interested in a tape-oriented system.

Assignment Symbols for Initial Run

Arbitrary assignment symbols have been chosen for use in the Master file. Therefore, the first run made by each user *must* be made on the basis of these assignment symbols. For the initial run, MON$$ ASGN cards must be prepared. These cards assign physical units to those duties specified under "Basic Concepts — Disk-Oriented System."

The symbols available for assignment to the physical units for the initial System Generation run are listed in Table 3.

Programs Available

The programs available on the Master file for a disk-oriented system are:

IBSGDL	System Generation Disk Load
IBBOOT	Bootstrap, Resident Monitor, and Transitional Monitor
AUTOCODER	Processor
LINKLOAD	Linkage Loader
SG1	System Generation Program, Part 1
SG2	System Generation Program, Part 2
IBSGDL	Additional copy of System Generation Disk Load
MACROLIB	Macro Library
CREATLIB	Create Library
IBMLIBR	Relocatable Library

Physical Unit	Channel 1 Assignment Symbols	Channel 2 Assignment Symbols	Cylinders	AM	Start Track	End Track	HR	Note
Card Reader	*R1	R2						
Printer**	P1	P2						
Punch	None	None						
Tape (729 or 7330)	A0	B0						
	A1	B1						
	A2	B2						
Disk (see Note 1)	*D1	E1	12	00	0000	0479	00	2,7
	D2	E2	40	00	0480	2079	00	3,7
	D3	E3	30	00	2080	3279	00	4
	D4	E4	20	00	3280	4079	00	5
	D5	E5	15	00	4080	4679	00	6
	D6	E6	15	00	4680	5279	00	6
	D7	E7	15	00	5280	5879	00	6

* R1 is assigned as the SIU, but the unit assigned as SIU can be changed from the console.
D1 is assigned as the SOF, but the unit assigned as SOF can be changed from the console to E1.

** Although assignment symbols are given for the printer, the print routine is not included in the basic Resident Monitor used during the initial run. The user may include the routine by means of the first and tenth parameters of GEN08.

Note 1: Disk must be formatted for 150 cylinders. Format is Load mode with the record address equal to the track address and an HR identifier of 00. Address format: AMTTTTHR, as explained under "Organization of Data Files on Disk Storage."

Note 2: Assign area to Master file by means of console if channel 2 is used.

Note 3: Assign area D2 or E2 to Relocatable Library (LIB) by means of ASGN card.

Note 4: Assign area to Job file by means of ASGN card.

Note 5: Assign area to Go file by means of ASGN card.

Note 6: Assign Work files MW1, MW2, and MW3 by means of ASGN cards.

Note 7: When loading the operating section of the Master file onto disk, begin loading at module 0, track 0000. The Relocatable Library begins on module 0, track 0480. These areas correspond to D1 or E1 and D2 or E2.

Table 3. Assignment Symbols and Addresses, Disk System

Basic Resident Monitor

The basic Resident Monitor on the Master file has the following design.

System: 1410 Data Processing System with 60,000 positions of core storage

With:
1. Five-position console input area
2. Console printing of all Monitor control cards
3. Two channel, tape, disk, and unit-record IOCS
4. Error statistics
5. Write disk check

Without:
1. Labeling
2. Tele-Processing
3. Restart
4. Memory Dump file (MDM)
5. Standard Print routine
6. Standard Punch routine
7. AIU routine
8. POW
9. User-written service routines
10. Snapshot at unusual end of program

Symbolic units requiring assignment are: MGO, MJB, MW1, MW2, MW3, LIB.

Control cards used to generate the Master file are shown in Figure 20.

```
*** INSERT BOOTSTRAP CARD ***
     MON$$      DATE YRDAY
     MON$$      JOB  CREAT DISK MASTER FILE
     MON$$      ASGN LIB,D2
     MON$$      ASGN MJB,D3
     MON$$      ASGN MGO,D4
     MON$$      ASGN MW1,D5
     MON$$      ASGN MW2,D6
     MON$$      ASGN MW3,D7
     MON$$      MODE GO,SG
     MON$$      EXEQ AUTOCODER,,,NOFLG,NOPCH
                HEADRDISK MASTER FILE
                GEN01P1,R1,,P2,R2
                GEN02,1,A0,A1,A2
                GEN02,2,B0,B1,B2
                GEN03D1,00000000,0479,D2,00048000,2079,D3,00208000,3279,
                     D4,00328000,4079,D5,00408000,4679,D6,00468000,5279,
                     D7,00528000,5879
                GEN04E1,00000000,0479,E2,00048000,2079,E3,00208000,3279,
                     E4,00328000,4079,E5,00408000,4679,E6,00468000,5279,
                     E7,00528000,5879
                GEN081590000000,,55,5,009,D1,R1
                GEN09
                GEN104
                GEN11
                DEVDF1,7330,1402,1403
                DEVDF2,7330,1402,1403
                DSKDF1,00
                DSKDF2,00
                IOKDF1410,,,4,,,,8
                END
     MON$$      ASGN MW2,B0
     MON$$      EXEQ SG1
                CREATDMONITOR
                CREATDLINKLOAD
                CREATDAUTOCODE
                CREATDSYSGEN1
                CREATDSYSGEN2
                CREATIBSGDL
                END
     MON$$      EXEQ LINKLOAD
                INPUTMW2
     MON$$      EXEQ SG2
                LOCATM,MACROLIB
                INSERM
                LOCATC,CREATLIB
                INSERC
                LOCATR,IBMLIBR
                INSERR
                END
     MON$$      END
```

Figure 20. Control Cards that Generated the Master File for a Disk-Oriented System

This section lists the contents of the three libraries — Macro, Relocatable, and Create — as they are distributed on the Master file.

Macro Library Contents

The following Macro Library is contained on both the tape- and disk-oriented Master files. On a tape-oriented Master, its name is AUTOCODER. On a disk-oriented Master, its name is MACROLIB.

SEQUENCE	NAME	SEQUENCE	NAME
1	GET	14	GEN07
2	IOCTL	15	GEN08
3	UNCTL	16	GEN09
4	DTF	17	GEN10
5	STDIO	18	GEN11
6	MONOP	19	DEVDF
7	SYSIO	20	DSKDF
8	GEN01	21	IOKDF
9	GEN02	22	GENRM
10	GEN03	23	DUMP
11	GEN04	24	ENDLD
12	GEN05	25	LDPTC
13	GEN06	26	TPDIR

The user should refer to the section, "System Generation Control Cards," before attempting to perform any maintenance function on this library. The Class II control cards describe the operations that may be performed.

It is also recommended that if the user is not going to use an SGF or SOF for regeneration functions, he should delete the following macros from this library:

GEN01	GEN06	GEN11
GEN02	GEN07	GEN12
GEN03	GEN08	DEVDF
GEN04	GEN09	IOKDF
GEN05	GEN10	GENRM

For information concerning the use of the above macros in generating a system, the reader should refer to the section, "System Description Control Cards."

Relocatable Library Contents

The following is a list of all the relocatable subprograms (modules) contained in the Relocatable Library (IBMLIBR) of both the tape- and disk-oriented Master files. The modules are listed below in the order in which they are sequenced in the Relocatable Library. Refer to the section, "System Generation Control Cards," for information concerning operations on this library.

Sort Program Modules

IBSRTCOMAN
IBSRTPRIME
IBSRTCTLCD
IBSRTGASSR
IBSRTGASM3
IBSRTDUM00
IBSRTEQUAL
IBSRTIO101
IBSRTIO102
IBSRTIO104
IBSRTIO105
IBSRTREPLT
IBSRTREPLQ
IBSRTIO103
IBSRTIO106
IBSRTP1ASN
IBSRTDUM01
IBSRTEQASN (Duplicate)
IBSRTIO109
IBSRTIO110
IBSRTIO107
IBSRTIO108
IBSRTIO203
IBSRTIO201
IBSRTMNTS2
IBSRTMNTM2
IBSRTRPPH2
IBSRTIO205
IBSRTIO206
IBSRTDUM02
IBSRTARMG2
IBSRTIO204
IBSRTIO202
IBSRTIO314
IBSRTIO301
IBSRTIO302
IBSRTIO305
IBSRTIO306
IBSRTIO399
IBSRTMNTM3
IBSRTMNTS3
IBSRTRMRG3
IBSRTLKAD3
IBSRTIO303
IBSRTIO304
IBSRTSQTG3
IBSRTDUM03
IBSRTEQASN (Duplicate)
IBSRTSUPH3
IBSRTAMRG3
IBSRTIO307
IBSRTIO308
IBSRTIO310
IBSRTIO311
IBSRTIO312
IBSRTIO309

COBOL Object-Time Modules

IBCOBOL
IBCBLADOVR
IBCBLDSPLY
IBCBLCMPAR
IBCBLFLDMP
IBCBLALTST
IBCBLSUBSC
IBCBLACCPT
IBCBLPRFST
IBCBLPRFCT
IBCBLEXPON
IBCBLRDINT
IBCBLDVZER

FORTRAN Object-Time Modules

IBINTRP (Programmed interpretation, floating-point)
OVERFL, DVCHK, IBINTRP (Machine interpretation, floating-point)
IBCOMMON
IBLABEL
IBFOERR
IBINDX1
IBINDX2
IBINDX3
IBEXPFI
IBEXPFF
ALOG
EXP
EXIT
INT
AMAX0
AMIN0
FLOAT
MAX1
MIN1
IFIX
IBEXPII
IBBACKSP
IBREWIND
SQRT
IBENDFILE
ABS
IABS
AMAX1
MAX0
AMIN1
MIN0
COS
SIN
AMOD
AINT
SIGN
ISIGN
MOD
DIM
IDIM
ATAN
SLITE
SLITET

Random-Processing Scheduler Modules

IBRANDOM
IBRANDOM1 (Should be generated and placed here)
IBRANDOM2
IBRANDOM3
IBRANDOM4
IBRANDOM5
IBRANDOM6

Miscellaneous

IBLOOKM

Resident Monitor Modules

IBMVERSION
IBZRRTP
IBBSPTP
IBSIMTP
IBABTPM
IBABDKM
IBRDSIU
IBPRTUR
IBPRTTP
IBPRTNONE
IBPCHUR
IBPCHTP
IBPCHNONE
IBPPCOMMON
IBREADAIU
IBIOARM
IBAINQUIRY
IBZRRDK
IBSIMDK

Tele-Processing Supervisor Modules

TPPTCCH1
TPPTCCH2
TPSTARTCH1
TP1009CH1
TP1014CH10
TP1014CH11
TPTELCH10
TPTELCH11
TPTELCH12
TPENDCH1
TPSTARTCH2
TP1009CH2
TP1014CH20
TP1014CH21
TPTELCH20
TPTELCH21
TPTELCH22
TPENDCH2
TPSUPER
TPSUPERDR
TPSUPERTPO
TPTAPELDRA
TPTAPELDRR
TPDISKLDRA
TPDISKLDRR

Transitional Monitor Modules

IBREADMOCC
IBSCANM
IBEXQM
IBIOATM
IBSEARCHT
IBACCOUNT
IBPOWTRAN
IBSEARCHD

Sort Definition Program Module

IBSRTDEFIN

Linkage Loader Modules

IBLNKPROC
IBLNKGOTAP
IBLNKINTAP
IBLNKOUTAP
IBLNKGODSK
IBLNKINDSK
IBLNKOUDSK

Miscellaneous

IBUPPER

Autocoder Compiler Modules

IBAU10COMM
IBAU10INPT
IBAU10TPE1
IBAU10TPE2
IBAU10IOTB
IBAU20GENR
IBAU20TPE1
IBAU20TPE2
IBAU30ASGN
IBAU30SCAN
IBAU30TPE1
IBAU30SUBR
IBAU33SUBR
IBAU33TPE1
IBAU33RCUR
IBAU400TPT

Go Modules for Compilers

IBTOCGM
IBTPCGM
IBTCCGM
IBTNCGM
IBDOCGM
IBDPCGM
IBDCCGM
IBDNCGM

Autocoder Compiler Modules (continued)

IBAU40TPE1
IBAU50TPE1
IBAU50CREF
IBAU10DSK1
IBAU10DSK2
IBAU10DSK3
IBAU20DSK1
IBAU20DSK2
IBAU20DSK3
IBAU30DSK1
IBAU33DSK1
IBAU40DSK1
IBAU50DSK1

COBOL Compiler Modules

IBCBLCSP01
IBCBLCSP09
IBCBLCSP02
IBCBLCSP03
IBCBLPOMF1
IBCBLCST04
IBCBLCST05
IBCBLP1MF1
IBCBLP1MF2
IBCBLCST06
IBCBLP1MF3
IBCBLCST07
IBCBLP2MF1
IBCBLCSP08
IBCBLP2MF2
IBCBLP2MF3
IBCBLP2MF4
IBCBLP3MF1
IBCBLP3T01
IBCBLP4MF1
IBCBLP5MF1
IBCBLCSD04
IBCBLCSD05
IBCBLCSD06
IBCBLCSD07
IBCBLP3D01

FORTRAN Compiler Modules

IBFTNCMN
IBFTN05TO
IBFTN05
IBFTN10TO
IBFTN10TI
IBFTN10
IBFTN20TO
IBFTN20TI
IBFTN20
IBFTN25TI
IBFTN25
IBFTN05DO
IBFTN10DO
IBFTN10DI
IBFTN20DO
IBFTN20DI
IBFTN25DI

Utility Program Modules

IBUTILITY
IBCOREDCTL
IBCOREDUMP
IBTAPEDUMP
IB1301DUMP

Loader Modules for PTC Programs

TPLDDCP1
TPLDDCP2

System Generator Modules

IBSYSGEN1
IBSYSGEN2
IBDSYSGEN1
IBDSYSGEN2
IBDSYSGEN3
IBSGLDLDR

Tape-to-Disk SOF Load Modules

SGDLBOOT
IBDLIO
IBDLIOA
IBDLIOB
IBSGDLDR

Macro Print Modules

IBPRINTMT
IBPRINTMD
IBPRINTM

TP Library Generator Modules

TPATLIBGEN
TPRTLIBGEN
TPADLIBGEN
TPRDLIBGEN

Create Library Contents

The following Create Library is contained on both the tape- and disk-oriented Master files. Additional Create packets are documented in the following section of tables, but they are not provided as part of the Create Library. The name of the library is CREATLIB.

A "T" or "D" prefix on the name of a Create packet refers to an exclusively tape-oriented or disk-oriented packet. Where there is no prefix, the same package applies for both tape and disk.

TMONITOR
Includes IBBOOT, IBRESMON, and IBTRANSIT for tape system.
(No provision made for Tele-Processing Supervisor.)
RESTART
It must, when used, immediately follow the Monitor Create packet (or the appropriate CALL cards).
TSRTDEFIN
TLINKLOAD
SYSGEN3
TAUTOCODE
TCOBOL
TFORTRAN
UTILITIES
Includes COREDUMP, TAPEDUMP, and 1301DUMP.
TSYSGEN1
TSYSGEN2
TMACROPRT
DMONITOR
Includes IBSGDL and IBBOOT for a disk system. (Resident and Transitional Monitor are part of IBBOOT. No provision made for Tele-Processing Supervisor.)
DLINKLOAD
DAUTOCODE
DCOBOL
DFORTRAN
DSYSGEN1
DSYSGEN2
IBSGDL is repeated here (see DMONITOR) to provide facilities for SYSGEN to "INCLD" itself.
DMACROPRT
DSKLIBLDR
To place a Relocatable Library on disk.
TSYSTEM
DSYSTEM
LINKLOADTD
LINKLOADDT
TMONTP1
TMONTP2
DMONTP1
DMONTP2
TMONTPONLY
TMONTPONL2
DMONTPONLY
DMONTPONL2
IBSGDL

Creation Charts

The following charts show the Linkage Loader control cards that can be used to construct the IBM programs available within the system.

These charts show some of the permissible configurations of the programs. They also indicate those configurations that will be constructed by specific Create packets.

NOTE: Many of the modules contain imbedded calls. Because of this, a specific program may require modules not listed on the creation charts.

Use of the Creation Charts

The following example illustrates the use of these charts. Refer to the Linkage Loader chart, which shows that a total of eight possible configurations of the Linkage Loader can be generated. The Go file, the SOF (or SGF, during System Generation) and the library can each be on either tape or disk, giving a total of eight combinations. The user makes his selection from the possibilities given at the top of the table. For example, if all files are to be on tape, the first column is the appropriate one. The user then has the choice of calling Create packet TLINKLOAD or punching the appropriate cards as indicated at the lower portion of the table.

Where a Create packet name is given for a selected configuration, the lower half of the table shows the exact contents of this package. If there is no name entered and if the appropriate configuration is desired, the user must supply the cards indicated (in the order shown).

LINKAGE LOADER									
Go File on	Tape	X	X	X	X				
	Disk					X	X	X	X
SOF on	Tape	X	X			X	X		
	Disk			X	X			X	X
LIB on	Tape	X		X		X		X	
	Disk		X		X		X		X
Create Packet Name		TLINKLOAD							DLINKLOAD
16	21								
PHASE	LINKLOAD	X	X	X	X	X	X	X	X
CALL	IBLNKPROC	X	X	X	X	X	X	X	X
CALL	IBLNKGOTAP	X	X	X	X				
CALL	IBLNKGODSK					X	X	X	X
CALL	IBLNKINTAP	X		X		X		X	
CALL	IBLNKINDSK		X		X		X		X
CALLN	IBLNKOUTAP	X	X			X	X		
CALLN	IBLNKOUDSK			X	X			X	X

Monitor Modules in Relocatable Library

REQUIRED	REQUIRED: TAPE ONLY	REQUIRED: DISK ONLY
IBACCOUNT	IBBSPTP	IBDCCGM
IBAINQUIRY	IBSEARCHT	IBDNCGM
IBEXEQM	IBSIMTP	IBDOCGM
IBIOARM	IBTCCGM	IBDPCGM
IBIOATM	IBTNCGM	IBSEARCHD
IBPPCOMMON	IBTOCGM	IBSIMDK
IBRDSIU	IBTPCGM	IBZRRDK
IBBREADMOCC	IBZRRTP	IBABDKM
IBSCANM	IBABTPM	
IBMVERSION		

CONDITIONAL	
IBPCHNONE	(No Standard Punch Unit)
IBPCHTP	(SPU is tape)
IBPCHUR	(SPU is 1402 Card Read Punch)
IBPRTNONE	(No Standard Print Unit)
IBPRTTP	(SPR is tape)
IBPRTUR	(SPR is 1403 Printer)
IBLOOKM	(Required by Utility programs)
IBREADAIU	(System includes Alternate Input Unit)
IBPOWTRAN	(POW required for tape SPR and/or SPU)
SNAPSHOT	(Required for Snapshot capability)

SYSTEM MONITOR				
SOF on	Tape		X	
	Disk			X
Create Packet Name			TMONITOR	DMONITOR
	16	21		
	PHASE	IBSGDL		X
*	CALL	SGDLBOOT		X
	PHASE			X
**	CALL	IBDLIO		X
**	CALLN	IBSGDLDR		X
	PHASE	IBBOOT	X	X
*	CALL	IBBOOT1T	X	
*	CALL	IBBOOT2D		X
	PHASE		X	X
*	CALL	IBBOOT2T	X	
	PHASE	IBRESMON	X	
	PRTCT	00000	X	X
*	CALLN	IBRESIOCS	X	X
*	CALLN	IBRESIDENT	X	X
*	CALLN	IBMENDM	X	X
	PHASE			X
	PHASE	IBTRANSIT	X	
*	CALLN	IBTRANSIT	X	X
		61		
***	PHASE	1	X	X
	DISGO		X	
	PRTCT		X	X

* This module was created by macro generation as directed by GEN01, GEN11, DEVDF, or IOKDF.
** This module is contained in the Relocatable Library.
*** To insert Directory 1.

RESTART PROGRAM			
Create Packet Name			RESTART
	16	21	
	CONGO		X
	PRTCT	00000	X
	PHASE	RESTART	X
*	CALL	IBRSTMOD1	X
	PHASE		X
*	CALL	IBRSTMOD2	X
	PHASE		X
*	CALL	IBRSTMOD3	X
	DISGO		X
	PRTCT		X

* This module is generated with the Resident IOCS.

MONITOR (For Tele-Processing System)									
SOF On	Tape	X	X			X	X		
	Disk			X	X			X	X
Create Packet Name		TMONTP1	TMONP2	DMONTP1	DMONTP2	TMONTPONLY	TMONTPONL2	DMONTONLY	DMONTPONL2
16 21									
PHASE	IBSGDL			X				X	
CALL	SGDLBOOT			X				X	
PHASE				X				X	
CALL	IBDLIO			X				X	
CALLN	IBSGDLDR			X				X	
PHASE	IBBOOT	X		X		X		X	
CALL	IBBOOT1T	X				X			
CALL	IBBOOT2D			X				X	
PHASE		X		X		X		X	
CALL	IBBOOT2T	X				X			
PHASE	IBRESMON	X				X			
PRTCT	00000	X		X		X		X	
CALLN	IBRESIOCS	X		X		X		X	
CALLN	IBRESIDENT	X		X		X		X	
CALLN	IBRESIDENT2						X		X
CALLN	IBMENDM		X		X		X		X
PHASE					X				X
PHASE	IBTRANSIT		X				X		
CALLN	IBTRANSIT		X		X		X		X
	61								
PHASE	1		X		X		X		X
DISGO			X		X				
PRTCT			X		X		X		X

AUXILIARY LINKAGE LOADER*		
SOF on Tape; Disk TP Library	X	
SOF on Disk; Tape TP Library		X
Create Packet Name	LINKLOADTD	LINKLOADDT
16 21		
PHASE LINKLOADTD	X	
PHASE LINKLOADDT		X
CALL IBLNKPROC	X	X
CALL IBLNKGOTAP	X	
CALL IBLNKGODSK		X
CALL IBLNKINTAP	X	
CALL IBLNKINDSK		X
CALLN IBLNKOUDSK	X	
CALLN IBLNKOUTAP		X

* These configurations of the Linkage Loader are for use in Tele-Processing Systems that store the TP Library file in a storage medium different from that used for the SOF and Job file (disk TP Library in a tape-oriented system, or tape TP Library file in a disk-oriented system).

AUTOCODER						
Work Files and Go Files on	Tape		X	X		
	Disk				X	X
Processor Resides on	Tape		X		X	
	Disk			X		X
Create Packet Name			TAUTOCODE			DAUTOCODE
6	16	21				
001	PHASE	AUTOCODER	X	X	X	X
	CALL	IBAU10COMM	X	X	X	X
	CALLN	IBAU10INPT	X	X	X	X
	CALL	IBAU10TPE1	X	X		
	CALL	IBAU10TPE2	X			
	CALL	IBAU10DSK1			X	X
	CALL	IBAU10DSK2		X		X
	CALL	IBAU10DSK3			X	
	CALL	IBAU10IOTB	X	X	X	X
		61				
* 010	PHASE	3	X	X	X	X
		62				
** 015	PHASE	M	X		X	
020	PHASE		X	X	X	X
	CALLN	IBAU20GENR	X	X	X	X
	CALL	IBAU20TPE1	X	X		
	CALL	IBAU20TPE2	X			
	CALL	IBAU20DSK1			X	X
	CALL	IBAU20DSK2		X		X
	CALL	IBAU20DSK3			X	
030	PHASE		X	X	X	X
	CALLN	IBAU30ASGN	X	X	X	X
	CALL	IBAU30SCAN	X	X	X	X
	CALL	IBAU30TPE1	X	X		
	CALL	IBAU30DSK1			X	X
	CALLN	IBAU30SUBR	X	X	X	X
033	PHASE		X	X	X	X
	CALLN	IBAU33SUBR	X	X	X	X
	CALL	IBAU33TP1	X	X		
	CALL	IBAU33DSK1			X	X
	CALLN	IBAU33ACUR	X	X	X	X
040	PHASE		X	X	X	X
	CALLN	IBAU40OTPT	X	X	X	X
	CALL	IBTOCGM	X	X		
	CALL	IBDOCGM			X	X
	CALL	IBTPCGM	X	X		
	CALL	IBDPCGM			X	X
	CALL	IBTCCGM	X	X		
	CALL	IBDCCGM			X	X
	CALL	IBTNCGM	X	X		
	CALL	IBDNCGM			X	X
	CALLN	IBAU40TPE1	X	X		
	CALLN	IBAU40DSK1			X	X
050	PHASE		X	X	X	X
	CALL	IBAU50TPE1	X	X		
	CALL	IBAU50DSK1			X	X
	CALLN	IBAU50CREF	X	X	X	X

* To insert Directory 3
** To insert the Macro Library

COBOL: Relocatable Library Modules for Object Programs

The following modules are required by COBOL object programs:

IBCOBOL
IBCBLADOVR
IBCBLDSPLY
IBCBLCMPAR
IBCBLFLDMP
IBCBLALTST
IBCBLSUBSC
IBCBLACCPT
IBCBLPRFST
IBCBLPRFCT
IBCBLEXPON
IBCBLRDINT
IBCBLDVZER

COBOL						
Go File on	Tape		X	X		
	Disk				X	X
Work Files on	Tape		X		X	
	Disk			X		X
Create Packet Name			TCOBOL			DCOBOL
6	16	21				
001	PHASE	COBOL	X	X	X	X
	CALL	IBTNCGM	X	X		
	CALL	IBDNCGM			X	X
	CALLN	IBCBLCSP01	X	X	X	X
	CALL	IBCBLCSP09	X	X	X	X
	CALLN	IBCBLCSP02	X	X	X	X
	CALL	IBCBLCSP03	X	X	X	X
	CALLN	IBTOCGM	X	X		
	CALLN	IBDOCGM			X	X
	CALL	IBCBLPOMF1	X	X	X	X
010	PHASE		X	X	X	X
	BASE1	IBTOCGM	X	X		
	BASE1	IBDOCGM			X	X
	CALL	IBTPCGM	X	X		
	CALL	IBDPCGM			X	X
	CALLN	IBCBLCST04	X		X	
	CALLN	IBCBLCSD04		X		X
	CALL	IBCBLCST05	X		X	
	CALL	IBCBLCSD05		X		X
	CALLN	IBCBLP1MF1	X	X	X	X
015	PHASE		X	X	X	X
	PRTCT	IBCBLP1MF1	X	X	X	X
	BASE1	IBCBLP1MF1	X	X	X	X
	CALL	IBCBLP1MF2	X	X	X	X
020	PHASE		X	X	X	X
	BASE1	IBCBLP1MF2	X	X	X	X
	CALL	IBCBLCST06	X		X	
	CALL	IBCBLCSD06		X		X
	CALLN	IBCBLP1MF3	X	X	X	X
025	PHASE		X	X	X	X
	PRTCT		X	X	X	X
	BASE1	IBCBLCST04	X		X	
	BASE1	IBCBLCSD04		X		X
	CALL	IBCBLCST07	X		X	
	CALL	IBCBLCSD07		X		X
	CALLN	IBCBLP2MF1	X	X	X	X
030	PHASE		X	X	X	X
	BASE1	IBCBLCSP02	X	X	X	X
	CALL	IBCBLCST04	X		X	
	CALL	IBCBLCSD04		X		X
	CALLN	IBCBLCST06	X		X	
	CALLN	IBCBLCSD06		X		X
	CALL	IBCBLCST07	X		X	
	CALL	IBCBLCSD07		X		X
	CALLN	IBCBLCSP08	X	X	X	X
035	PHASE		X	X	X	X
	CALL	IBCBLP2MF2	X	X	X	X
040	PHASE		X	X	X	X
	BASE1	IBCBLP2MF2	X	X	X	X
	CALL	IBCBLP2MF3	X	X	X	X
045	PHASE		X	X	X	X
	BASE1	IBCBLP2MF3	X	X	X	X
	CALL	IBCBLP2MF4	X	X	X	X
050	PHASE		X	X	X	X
	BASE1	OLEE/	X	X	X	X
	CALL	IBTPCGM	X	X		
	CALL	IBDPCGM			X	X
	CALLN	IBCBLP3MF1	X	X	X	X
	CALL	IBCBLP3T01	X		X	
	CALL	IBCBLP3D01		X		X
055	PHASE		X	X	X	X
	BASE1	IBCBLP3MF1	X	X	X	X
	CALL	IBCBLCSP03	X	X	X	X
	CALLN	IBCBLCST07	X		X	
	CALLN	IBCBLCSD07		X		X
	CALL	IBCBLCSP08	X	X	X	X
	CALLN	IBTCCGM	X	X		
	CALLN	IBDCCGM			X	X
	CALL	IBCBLP4MF1	X	X	X	X
060	PHASE		X	X	X	X
	CALL	IBCBLP5MF1	X	X	X	X

FORTRAN: Relocatable Library Modules for Object Programs

REQUIRED MODULES

The following modules are required to run with any FORTRAN object program:

IBCOMMON	IBINDX2	IBBACKSP	EXP
IBLABEL	IBINDX3	IBENDFILE	ALOG
IBFOERR	IBEXPFF	IBREWIND	
IBINTRP	IBEXFPI	FLOAT	
IBINDX1	IBEXPII	IFIX	

OPTIONAL MODULES

The following modules are not required by a FORTRAN program unless they are called by name in the source program. Inclusion of these modules is therefore an installation option, except (as noted) the selection of one optional module may require another.

ABS	DIM
AINT	DVCHK
AMAX0	EXIT
AMAX1	INT
AMIN0	IABS
AMIN1	IDIM
AMOD (requires AINT)	ISIGN
ATAN	MAX0
COS (requires SIN)	MAX1
MIN0	SIN
MIN1	SLITE (requires SLITET)
MOD	SLITET
OVERFL	SQRT
SIGN	

FLOATING-POINT ARITHMETIC MODULES

The four modules supporting floating-point arithmetic are on the Relocatable Library of the Master file in the following order:

POSITION	NAME	REMARKS
1	IBINTRP	For *programmed interpretation* of floating-point instructions.
2	OVERFL	For *machine interpretation* of floating-point instructions (on an IBM 7010 with the Floating-Point Arithmetic feature).
3	DVCHK	
4	IBINTRP	

To obtain the modules supporting the 7010 Floating-Point Arithmetic feature, the following card should be used:

```
6          16      21
IBINTRP    DELET   R
```

To obtain the modules that provide programmed interpretation for floating-point instructions, use this card:

```
6          16      21
OVERFL     DELET   R,IBNTRP
```

FORTRAN						
Work Files on	Tape		X	X		
	Disk				X	X
Go File on	Tape		X		X	
	Disk			X		X
Create Packet Name			TFORTRAN			DFORTRAN
	16	21				
	PHASE	FORTRAN	X	X	X	X
	CALLN	IBFTNCMN	X	X	X	X
	CALL	IBFTN05TO	X	X		
	CALL	IBFTN05DO			X	X
	CALLN	IBFTN05	X	X	X	X
	PHASE		X	X	X	X
	BASE1	FCMN/	X	X	X	X
	CALL	IBTPCGM	X		X	
	CALL	IBDPCGM		X		X
	CALL	IBTCCGM	X		X	
	CALL	IBDCCGM		X		X
	CALL	IBTNCGM	X		X	
	CALL	IBDNCGM		X		X
	CALLN	IBTOCGM	X		X	
	CALLN	IBDOCGM		X		X
	CALL	IBFTN10TO	X	X		
	CALL	IBFTN10DO			X	X
	CALL	IBFTN10TI	X	X		
	CALL	IBFTN10DI			X	X
	CALLN	IBFTN10	X	X	X	X
	PHASE		X	X	X	X
	BASE1	MOCG/	X	X	X	X
	CALL	IBFTN20TO	X	X		
	CALL	IBFTN20DO			X	X
	CALL	IBFTN20TI	X	X		
	CALL	IBFTN20DI			X	X
	CALLN	IBFTN20	X	X	X	X
	PHASE		X	X	X	X
	BASE1	MOCG/	X	X	X	X
	CALL	IBFTN25TI	X	X		
	CALL	IBFTN25DI			X	X
	CALLN	IBFTN25	X	X	X	X

Generalized Tape Sorting Program: Relocatable Library Modules

To create any sort program, all of the following modules must appear in a Relocatable Library and should be in the order given. Module IBSRTEQASN must be included twice, as shown.

IBSRTCOMAN	IBSRTIO206
IBSRTPRIME	IBSRTDUM02
IBSRTCTLCD	IBSRTAMRG2
IBSRTGASSR	IBSRTIO204
IBSRTGASM3	IBSRTIO202
IBSRTDUM00	IBSRTIO314
IBSRTEQUAL	IBSRTIO301
IBSRTIO101	IBSRTIO302
IBSRTIO102	IBSRTIO305
IBSRTIO104	IBSRTIO306
IBSRTIO105	IBSRTIO399
IBSRTREPLT	IBSRTMNTM3
IBSRTREPLQ	IBSRTMNTS3
IBSRTIO103	IBSRTRMRG3
IBSRTIO106	IBSRTLKAD3
IBSRTP1ASN	IBSRTIO303
IBSRTDUM01	IBSRTIO304
*IBSRTEQASN	IBSRTSQTG3
IBSRTIO109	IBSRTDUM03
IBSRTIO110	*IBSRTEQASN
IBSRTIO107	IBSRTSUPH3
IBSRTIO108	IBSRTAMRG3
IBSRTIO203	IBSRTIO307
IBSRTIO201	IBSRTIO308
IBSRTMNTS2	IBSRTIO310
IBSRTMNTM2	IBSRTIO311
IBSRTRPPH2	IBSRTIO312
IBSRTIO205	IBSRTIO309

SORT DEFINITION PROGRAM		
Create Packet Name		TSRTDEFIN
16	21	
PHASE	SORTDEFINE	X
CALL	IBSRTDEFIN	X

SGI PROGRAM				
SGF or	Tape		X	
SOF on	Disk			X
Create Packet Name			TSYSGEN1	DSYSGEN1
16	21			
PHASE	SG1		X	X
CALL	IBSYSGEN1		X	
CALL	IBDSYSGEN1			X
		61		
* PHASE		1	X	

* To insert Directory 1.

UTILITY PROGRAMS*								
Storage Print			X	X	X	X			
Tape Print				X	X		X	X	
1301 Disk Print					X	X		X	X
Create Packet Name					UTILITIES				
6	16	21							
001	PHASE	UTILITIES	X	X	X	X	X	X	X
	CALL	IBUTILITY	X	X	X	X	X	X	X
002	PHASE		X	X	X	X			
	CALLN	IBCOREDCTL	X	X	X	X			
	CALL	IBCOREDUMP	X	X	X	X			
003	PHASE			X	X		X	X	
	CALL	IBTAPEDUMP		X	X		X	X	
004	PHASE				X	X		X	X
	CALL	IB1301DUMP			X	X		X	X

* The Snapshot Program, if selected, is generated as part of the System Monitor.

SG2 PROGRAM			
SGR or SOF on	Tape	X	
	Disk		X
Create Packet Name		TSYSGEN2	DSYSGEN2
16 21			
PHASE	SG2	X	X
CALL	IBSYSGEN2	X	
CALL	IBSYSGEN2		X

MASTER TAPE LOAD PROGRAM*		
16 21		
PHASE	IBSGDL	X
CALL	SGDLBOOT	X
PHASE		X
CALL	IBDLIO	X
CALLN	IBSGDLDR	X

* If a disk SOF (or SGF) is to have regenerative ability, this program must be the last program on the file.

SG3 PROGRAM		
Create Packet Name		SYSGEN3
16 21		
PHASE	SG3	X
CALL	IBUPPER	X

MACRO PRINT PROGRAM			
Macro Library on	Tape	X	
	Disk		X
Create Packet Name		TMACROPRT	DMACROPRT
16 21			
PHASE	MACROPRT	X	X
* CALL	IBPRINTMT	X	
* CALL	IBPRINTMD		X

* Contains an imbedded call for module IBPRINTM.

DISK LIBRARY LOADER		
16 21		
PHASE	DSKLIBLDR	X
CALL	IBSGLDLDR	X

COMPLETE SYSTEMS				
SOF is on	Tape		X	
	Disk			X
Create Packet Name			TSYSTEM	DSYSTEM
TMONITOR			X	
DMONITOR				X
TSRTDEFIN			X	X
TAUTOCODE			X	
DAUTOCODE				X
TLINKLOAD			X	
DLINKLOAD				X
		62		
PHASE	IBMLIBR	R	X	
TCOBOL			X	
DCOBOL				X
TFORTRAN			X	
DFORTRAN				X
UTILITIES			X	X
TSYSGEN1			X	
DSYSGEN1				X
		62		
PHASE	CREATLIB	C	X	
TSYSGEN2			X	
DSYSGEN2				X
SYSGEN3			X	X
TMACROPRT			X	
DMACROPRT				X
DSKLIBLDR				X
IBSGDL (must be last)				X

This section illustrates a series of four interrelated System Generation jobs for a tape-oriented system. Setup requirements for the tape units are given for each example. The setup information relates Table 1 of this publication and the ASGN cards required by the specific example.

Beginning with the IBM-supplied Master file, the successive examples are:

Example 1 — Generation of Master file with SPR
Example 2 — Generation of SGF
Example 3 — Generation of modified SGF
Example 4 — Generation of Autocoder/FORTRAN SOF

Example 1

Example 1, Figure 21, illustrates generation, from the Master file, of a system of the same configuration as the Master file, except that the Standard Print Unit (SPR) capability has been added.

```
MON$$    DATE YRDAY
MON$$    JOB  SAMPLE NO.1 TO GENERATE MASTER WITH SPR
MON$$    ASGN MGO,A1
MON$$    ASGN MR0,A1
MON$$    ASGN MJB,A2
MON$$    ASGN MW3,A2
MON$$    ASGN MW2,A3
MON$$    ASGN MW1,A4
MON$$    MODE GO,SG
MON$$    EXEQ AUTOCODER,,,NOFLG,NOPCH
         HEADRSAMPLE NO.1
         GEN01P1,R1,,P2,R2
         GEN02,1,A0,A1,A2,A3,A4,A5
         GEN02,2,B0,B1,B2,B3,B4,B5
         GEN081300000100,,55,5,009,A0,R1,,,P1
         GEN091
         GEN104
         GEN11
         DEVDF1,7330,1402,1403
         DEVDF2,7330,1402,1403
         IOKDF1410,,,4
         END
MON$$    EXEQ SG1                                    7
         LOCATC,CREATLIB
         INSERC
         LOCATR,IBMLIBR
         INSERR
         LOCATM,AUTOCODER
         INSERM
         END
         CREATTMONITOR
         CREATTAUTOCODE
         CREATTSYSGEN1                               C
         PHASECREATLIB
         CREATTLINKLOAD                              R
         PHASEIBMLIBR
         CREATTSYSGEN2
         END
MON$$    EXEQ LINKLOAD
         INPUTMW2
MON$$    EXEQ SG2                                    7
MON$$    END
```

Figure 21. Control Cards that Reproduce the Master File of a Tape System with SPR Capability Added

CONTENTS OF NEW RESIDENT MONITOR

System description control cards define a new System Monitor as follows:

GEN01 defines:
  Printer and reader on channel 1
  Printer and reader on channel 2

GEN02 defines:
  Six tape units on channel 1 (A0-A5)
  Six tape units on channel 2 (B0-B5)

GEN08 defines:
  IBM 1410
  40,000 positions of core storage; therefore, output file can be used on machine of any size.
  1403 Printer as SPR
  55 to be entered in Communication Region, /LIN/
  Five-character console input area
  Monitor control cards are to be typed
  SOF assigned to A0 (tape unit 10)
  SIU assigned to R1 (channel 1 reader)
  SPR assigned to P1 (channel 1 printer)

GEN09 defines:
  One Monitor Reserve file (MR0)

GEN10 defines:
  Four Monitor Work files (MW0-MW3)

GEN11 defines:
  No TP files

DEVDF defines:
  7330 (or 729) tape units on channel 1
  1402 Card Reader on channel 1
  1403 Printer on channel 1
  7330 (or 729) tape units on channel 2
  1402 Card Reader on channel 2
  1403 Printer on channel 2

IOKDF defines:
  IBM 1410 System
  Error statistics

The following points are illustrated by this example.

1. Assignment of symbolic units (e.g., MGO) is determined by the user. A1-A5 or B0-B5 can be used. The Master file is assigned within Monitor to A0. In this example all assignments are on channel 1. MJB, MW3, and MGO, MR0 share the same tape units. The user can change these assignments.

2. Within GEN08, character 8 of parameter 1 ("1") and parameter 10 ("P1") define SPR as a 1403 Printer. SPR can be assigned to a tape unit by changing character 8 from a "1" to a "2", and parameter 10 from "P1" to any tape unit (e.g., A5).

3. EXEQ SG1 and EXEQ SG2 cards *must* have machine size indicators ("5", "7", or "9") punched in card column 59 if the machine being used does not have 40,000 core-storage positions.

SETUP INSTRUCTIONS

Setup instructions for this example are:

1. Mount the Master file on A0.
2. Mount scratch tapes on A1, A2, A3, and A4.
3. Output tape will be on MW2.

Example 2

Example 2, Figure 22, illustrates the generation of an SGF from the file created in Example 1. The user's installation is assumed to include a machine of the following configuration.

System:	IBM 1410 with two input/output channels and 80,000 positions of core storage No Tele-Processing No disk storage
Channel 1:	1402 Card Read Punch 1403 Printer Six 729 tape units
Channel 2:	Six 729 tape units

```
MON$$    DATE YRDAY
MON$$    JOB  SAMPLE NO.2 TO GENERATE AN INSTALLATION SGF
MON$$    ASGN MJB,A1
MON$$    ASGN MW3,A1
MON$$    ASGN MW1,A2
MON$$    ASGN MW2,B1
MON$$    ASGN MGO,B2
MON$$    ASGN MR0,B2
MON$$    MODE GO,SG
MON$$    EXEQ AUTOCODER,SOF,SIU,NOFLG,NOPCH
         HEADRSAMPLE NO.2
         GEN01PR,RD,PU
         GEN02/MDM/,1,A0,A1,A2,A3,A4,A5
         GEN02/MDM/,2,B0,B1,B2,B3,B4,B5
         GEN081700090119,,55,10,099,A0,RD,,,PR,PU,,,B4,SNAP
         GEN095
         GEN105,,B0,A1,B1
         GEN11
         DEVDF1,729,1402,1403
         DEVDF2,729
         IOKDF1410,,,4,,,,,,70000
         END
MON$$    EXEQ SG1                                        7
         LOCATC,CREATLIB
         INSERC
         LOCATR,IBMLIBR
         INSERR
         LOCATM,AUTOCODER
         INSERM
         END
         CREATTMONITOR
         CREATTAUTOCODE
         CREATTSYSGEN1
         PHASECREATLIB                                     C
         CREATTSRTDEFIN
         CREATTLINKLOAD
         PHASEIBMLIBR                                    R
         CREATTSYSGEN2
001      PHASEUTILITIES
         CALL IBUTILITY
002      PHASE
         CALLNIBCOREDCTL
         CALL IBCOREDUMP
003      PHASE
         CALL IBTAPEDUMP
         END
MON$$    EXEQ LINKLOAD
         INPUTMW2
MON$$    EXEQ SG2                                       L7
MON$$    END
```

Figure 22. Control Cards to Generate an SGF from the File Created by the Cards of the Preceding Figure

CONTENTS OF NEW RESIDENT MONITOR

System description control cards define a new System Monitor as follows.

GEN01 defines:
- Printer, reader, and punch on channel 1

GEN02 defines:
- Core Image file
- Six tape units on channel 1 (A0-A5)
- Six tape units on channel 2 (B0-B5)

GEN08 defines:
- IBM 1410 System
- 80,000 positions of core storage
- Core Image file
- Unit-record printer
- Unit-record punch
- Alternate input routine (AIU)
- 55 to be entered in Communication Region, /LIN/
- Ten-character console input area
- Type and print Monitor control cards
- SOF assigned to A0
- SIU assigned to RD
- SPR assigned to PR
- SPU assigned to PU
- MDM assigned to B4
- Memory print Snapshot at unusual end of program

GEN09 defines:
- 5 Monitor Reserve files (MR0-MR4)

GEN10 defines:
- 5 Monitor work files (MW0-MW4)
- MW1 assigned to B0
- MW2 assigned to A1
- MW3 assigned to B1

GEN11 defines:
- No TP files

DEVDF defines:
- 729 tape units on channel 1
- 1402 Card Read Punch on channel 1
- 1403 Printer on channel 1
- 720 tape units on channel 2

IOKDF defines:
- IBM 1410 System
- Error statistics to be taken
- /OGR/ at 70000

The following points are illustrated by this example.

1. The Sort Definition program and one configuration of the Utility program are generated in addition to those that were on the Master file. The Create Library packet for the Utility program is not used in order to show how the Linkage Loader control cards are placed. Also, since there is no disk storage, the 1301 Dump Utility is omitted.

2. The "L" in card column 58 of the EXEQ SG2 card indicates that the largest size records are to be built.

SETUP INSTRUCTIONS

Setup instructions for this example are:

1. Mount Master file with SPR (output of Example 1) on A0.
2. Mount scratch tapes on A1, A2, B1, B2.
3. The output tape will be on MW2.

Example 3

Example 3, Figure 23, illustrates the modification of the SGF created in Example 2.

The following points are illustrated by this example.

1. The Monitor from Example 2 is copied onto the new file.

2. A two-phase user program (USERPROG) is added. The first phase comprises SUBPROG1 and SUBPROG2. The second phase consists of SUBPROG3. The relocatable subprograms are added to IBMLIBR after compilation. The appropriate Linkage Loader control cards have been combined into a package and added to CREATLIB. USERPROG is put into the operating section of the modified SGF.

3. SG1 and SG2 cards no longer require machine size indicators.

4. The "L" in card column 58 of the EXEQ SG2 card indicates that USERPROG is to be built in largest size records. The other programs are already in largest size.

5. Multiple copies of the Transitional Monitor (IBTRANSIT) are added to reduce search time during future operations.

6. MW1, MW2, and MW3 are assigned within Monitor; therefore, no ASGN cards are needed for them. See GEN10, in Example 2.

SETUP INSTRUCTIONS

Setup instructions for this example are:

1. Mount the SGF on A0.
2. Mount scratch tapes on A1, B0, B1, B2.
3. The output tape will be on MW2.

```
MON$$     DATE YRDAY
MON$$     JOB  SAMPLE NO. 3 SGF WITH USER PROGRAM AND IBTRANSITS
MON$$     ASGN MJB,B1
MON$$     ASGN MGO,B2
MON$$     ASGN MRO,B2
MON$$     MODE GO,SG
MON$$     EXEQ AUTOCODER
                       SOURCE DECK FOR SUBPROGRAM NO.1
                       SOURCE DECK FOR SUBPROGRAM NO.2
                       SOURCE DECK FOR SUBPROGRAM NO.3
MON$$     EXEQ SG1
          LOCATC,CREATLIB
USERPROG  INSERC
          GENERUSERPROG
          PHASEUSERPROG
          CALL SUBPROG1
          CALL SUBPROG2
          PHASE
          BASE1SUBPROG2
          CALL SUBPROG3
          LOCATR,IBMLIBR
SUBPROG1  INSERR
SUBPROG2  INSERR
SUBPROG3  INSERR
          LOCATM,AUTOCODER
          INSERM
          END
          INCLDIBBOOT
          INCLDIBRESMON
          INCLDIBTRANSIT
          INCLDAUTOCODER
          INCLDIBTRANSIT
          END
MON$$     EXEQ LINKLOAD
          PHASEUSERPROG
          CALL SUBPROG1
          CALL SUBPROG2
          PHASE
          BASE1SUBPROG2
          CALL SUBPROG3
MON$$     EXEQ SG1
          INCLDIBTRANSIT
          INCLDSG1
          INCLDCREATLIB
          INCLDIBTRANSIT
          INCLDLINKLOAD
          INCLDIBMLIBR
          INCLDSG2
          INCLDIBTRANSIT
          END
MON$$     EXEQ SG2
MON$$     END
```

Figure 23. Control Cards to Modify the SGF Created by the Cards of the Preceding Figure

Example 4

Example 4, Figure 24, illustrates the creation of an SOF, designed for efficient FORTRAN and Autocoder compile-and-go operation, from the file created in Example 3.

The following points are illustrated by this example.

1. The Go file (MGO) is not required in this job.
2. The IBMLIBR is stripped to retain only those subprograms required for FORTRAN and Snapshot.
3. The Macro Library is stripped to retain only those Autocoder macro routines used by dependent programs. The Monitor-generation macro routines are deleted.
4. The CREATLIB is not referenced; therefore, it is not included.
5. FORTRAN is generated from IBMLIBR.
6. USERPROG is included.
7. The file is sequenced for efficiency.

SETUP INSTRUCTIONS

Setup instructions for this example are:

1. Mount the modified SGF (output from Example 3) on A0.
2. Mount scratch tapes on A1, B0, B2, B3.
3. The output tape will be on MW2.

```
MON$$     DATE YRDAY
MON$$     JOB  SAMPLE NO. 4 SOF WITH AUTOCODER AND FORTRAN
MON$$     ASGN MW1,B0
MON$$     ASGN MW2,B1
MON$$     ASGN MJB,B2
MON$$     ASGN MR0,B3
MON$$     MODE SG
MON$$     EXEQ SG1
          LOCATR,IBMLIBR
IBSRTCOMANDELETR,IBCBLDVZER
IBRANDOM  DELETR,TPRDLIBGEN
          LOCATM,AUTOCODER
GEN01     DELETM
GEN02     DELETM
GEN03     DELETM
GEN04     DELETM
GEN05     DELETM
GEN06     DELETM
GEN07     DELETM
GEN08     DELETM
GEN09     DELETM
GEN10     DELETM
GEN11     DELETM
DEVDF     DELETM
IOKDF     DELETM
GENRM     DELETM
DUMP      DELETM
ENDLD     DELETM
LDPTC     DELETM
TPDIR     DELETM
          END
          INCLDIBBOOT
          INCLDIBRESMON
          INCLDIBTRANSIT
          INCLDAUTOCODER
          CREATTFORTRAN
          END
MON$$     EXEQ LINKLOAD
          INPUTMW2
MON$$     EXEQ SG1
          INCLDIBTRANSIT
          INCLDLINKLOAD
          INCLDIBMLIBR
          INCLDIBTRANSIT
          INCLDUSERPROG
          INCLDIBTRANSIT
          END
MON$$     EXEQ SG2
MON$$     END
```

Figure 24. Control Cards to Create a FORTRAN/Autocoder SOF from the Output File of the Preceding Figure

This section explains: (1) the use of Disk Load program for loading the entire system, and (2) the Disk Library Loader for loading separately produced relocatable libraries. The Disk Load program operates outside the system and requires separate setup and operating procedures. The Disk Library Loader (DSKLIBLDR) operates within the system as a normal job.

Disk Load Program

The Disk Load program loads the contents of the disk system source tape and library tape onto disk in the areas specified by the user. This is the first program that appears on the disk Master file. Three configurations can be loaded by the program:

1. System tape and library tape physically the same reel.
2. System tape only.
3. System tape and library tape physically different reels.

When both the system and a library are to be loaded onto disk, two logically separate files are created on the disk.

Program Description

During the loading of the system tape, two directories are created. Directory 1 is the program directory; Directory 3 is the macro directory. Both directories are in a form suitable for use by table lookup instructions. The argument of each table is the program or macro name being sought and the function of each table is the corresponding track address of the first record of the program or macro. Both tables contain a short entry to terminate lookup. Should a program or macro contain more than one record, the additional records are found in the records that follow sequentially.

Multiphase programs are interconnected by control data contained in the first 12 characters of the first record of each phase. The first four characters of this data are the track number of the previous phase of the program, if any. If there is no previous phase this field contains blanks.

The next four characters of the control data are the track number of the next phase of the program, if any. If there is no subsequent phase, this field contains blanks. The next three characters of the data are the phase number of the phase located in that record. The last character of the field is for special use; it is the directory number if that record should be a directory.

Directory 1 may be more than one record. For this situation, the first record is linked to the next by a track number in the last four characters of the original record.

The macro directory, Directory 3, is limited in size. The maximum number of macro names that can be contained in the disk macro directory is 238, and any excess is lost. In this case, a diagnostic message is issued.

An additional directory is created as the first element of the Relocatable Library (a separate file). This directory is identical in format to Directory 1 and contains the names of the library subprograms.

Program Restrictions

The two program restrictions are:

1. No two successive directory requests are permitted.
2. The program is restricted to channels 1 and 2.

SETUP INSTRUCTIONS

The system tape, or system tape with library if they are on the same physical reel, must always be placed on a channel 1 or channel 2 tape unit to run the program. (If the LOAD TAPE button of the IBM 7010 is to be used, the reel must be mounted on unit 10.)

If the system tape and library tape are physically different reels, the library tape must be mounted on unit 10 or 20 for the IBM 1410. The system tape can be placed on any other channel 1 or channel 2 tape unit. For the IBM 7010, the system tape must be mounted on unit 10 and the library tape must be mounted on unit 20. Refer to the *Operator's Guide* for detailed operating instructions.

Console Messages

The console messages that follow are associated with the Disk Load program. Information should be provided to the operator so that those messages requiring operator action can be handled efficiently.

21551 ENTER START RCD AND CYLS FOR FILE ACMTTTTH2bNN

Description and Action: Enter in the indicated format the address from which file is to be started* and number of cylinders to be used.

A	Access
C	Channel
M	Module
TTTTH2	Disk geometric record address. (H2 is identified as HR under "Organization of Data Files on Disk Storage.")
b	Blank
NN	Number of cylinders to be used by file.

*This address must agree with the start address indicated on the GEN03-GEN06 card when the system was created.

21552 FILE XCDS CYL LGTH, PRESS START TO CONT.

Description and Action: Cylinder length (NN) too small. If disk format permits, file can be continued by pressing START.

11551 FILE START RCD XXXXXX, LAST RCD XXXXXX.

Description and Action: Message informs operator of area that file occupies. Disk record addresses are of the form TTTTH2 as explained for message 21551.

11553 MAC LIB OVFLO

Description and Action: Macro library directory is full (238 elements) and succeeding macros are lost.

BOOTSTRAPS
. . . (card image) . . . 1410 BOOT
. . . (card image) . . . 7010 BOOT

Description and Action: Message shows card image of bootstrap required to load the first record from disk to core storage. Operator must keypunch appropriate card for his machine (IBM 1410 or 7010) and place card in SIU. See the publication, *Operator's Guide* for complete procedure.

01551 END JOB

Description and Action: All operations are complete. System tape (and library tape, if any) has been loaded as specified by the character entered at location 00000 or by the contents of the system file being loaded.

21553 (Same as message 21551)

Description and Action: Same description and action as message 21551 except that this message pertains to the disk location desired for the Relocatable Library.

21554 (Same as message 21552)

Description and Action: Same as message 21552 except that this message 21554 pertains to the Relocatable Library.

11552 (Same as message 11551)

Description and Action: Same as message 11551 except that this message 11552 pertains to the Relocatable Library.

11554 INVALID FILE, NO DIR 1 REQUEST

Description and Action: System will not operate without Directory 1 which was not requested by Linkage Loader card.

11555 NO TAPE LABEL FOUND

Description and Action: Library tape was indicated to have a tape label by word mark entered in 00000, but no label was found.

11556 NO RLIB HEADER FOUND

Description and Action: Tape designated as Relocatable Library by character entered in 00000 does not contain the Relocatable Library header.

NOTE: The IOCS may generate other messages due to seek checks, no record found, etc. These may be caused by operator error in making console entries, incorrect formats, or disk unit malfunctions. The operator may cancel console inquiries in the event of error.

Disk Library Loader (DSKLIBLDR)

The Disk Library Loader loads the contents of a separate relocatable library tape onto the disk. This load program is a subprogram of the Master file. The library tape to be loaded must be on symbolic unit MW1, and the disk area loaded is that which is assigned as LIB.

Program Description

The first record of the file loaded on the disk is a directory of library subprograms that is built as the file is loaded. A brief description applicable to this directory is given earlier, under "Disk Load Program." The library tape is read in Move mode, and the disk is written in Load mode.

Setup Instruction and Use of Program

The relocatable library tape must be mounted on symbolic unit MW1.

The following example shows how the Disk Library Loader is used to load a relocatable library tape into LIB on disk storage.

```
6          16      21
MON$$      JOB     LOAD SEPARATE RELOC
                                    LIBE
MON$$      ASGN    MW1,A5
MON$$      ASGN    LIB,D8
MON$$      EXEQ    DSKLIBLDR
MON$$      END
```

Console Messages

The console messages that follow are associated with the Disk Library Loader.

DISK LIBRARY LOADER CONSOLE MESSAGES

91558 NO RLIB HEADER FOUND
Description and Action: Neither of the first two tape records was a relocatable library header. Control is returned to Monitor with NOGO switch turned on.

91556 RLIB XCDS DISK AREA
Description and Action: The Relocatable Library is too large to be loaded in the disk area assigned as LIB. Control is returned to Monitor with the NOGO switch turned on.

11557 RLIB START RCD XXXXXX, LAST RCD XXXXXX
Description and Action: Informs operator of disk area which relocatable library occupies. Disk record addresses are of the form TTTTH2 as explained for message 21551, "Disk Load Program."

SG1 and SG2 Diagnostic Messages

SG1 and SG2 diagnostic messages are listed in this section with an explanation of the message and suggested corrective action for: (1) tape-oriented systems, and (2) disk-oriented systems.

Tape-Oriented System

Diagnostic messages that may be produced on the console printer during execution of SG1 and SG2 are listed in sequence by message number in the following section. When one of these messages appears, processing halts and special end of program occurs unless the "Corrective Action" comment states that processing will continue or that no corrective action is to be taken. After the correction is made, the job must be rerun. Full instructions appear in the publication, *Operator's Guide.*

SG1 AND SG2 DIAGNOSTIC MESSAGES FOR A TAPE-ORIENTED SYSTEM

11501 XXXXXXXXXX NOT ON TAPE
Explanation: Request has been made for the named item but it cannot be located on the SOF or on the Relocatable or Create Library.
Corrective Action: Check control deck for proper call and/or spelling, etc.

11502 SEQERR-XXXXX
Explanation: A macro statement sequence number with low-order blank or an out-of-order sequence number has been encountered in the SIU.
Corrective Action: Generation continues but the statement in question is omitted from the library and is printed on the SPR. Check the control deck.

11503 DIRECTORY X NOT AVAILABLE
Explanation: X can be "1" or "3".
Corrective Action: Check the control deck to make sure directory has been generated previous to this reference. If X is not 1 or 3, the PHASE card for the directory has been mispunched.

11504 XXXXXXXXXX LIBRARY
Explanation: Request has been made for the namcd library but that library cannot be located or does not exist.
Corrective Action: Check the control deck to make sure that a library of the name XXXXXXXXXX has been copied, updated, or added by SG1.

11505 NEW SOF ON XXX
Explanation: XXX is the x-control field for the unit on which the System Generation *output* file is located.
Corrective Action: None.

11507 LIB TYP UNKNOWN
Explanation: Request has been made for a library whose type is not M, R, or C.
Corrective Action: Check control deck. The PHASE card for the library header may have been punched incorrectly. The M, R, or C must be in column 62 of the PHASE card.

11508 BACKSPACE FAILURE – SOF
Corrective Action: Restart.

11509 BACKSPACE FAILURE – MJB
Corrective Action: Restart.

11510 NEW LIBRARY ON XXX
Explanation: XXX is the x-control field for the unit on which the new library is located.
Corrective Action: None.

11511 UNKNOWN HDR TYP
Explanation: Header record is not proper format.
Corrective Action: Check control deck. Check that all the libraries processed by SG1 were done in one block and were processed before absolute programs. Also check that no conflict exists in input/output assignments.

11512 NO TYPC COUNTS
Explanation: Specific cause has not been determined.
Corrective Action: Check control deck for extraneous PHASE cards, order of cards, etc.

11513 EXTRANEOUS HEADER
Explanation: Record descriptions contained on MW1 (header records) do not agree with contents of Job file.
Corrective Action: Ensure that *all* requests for SG1 to INSER, DELET, REPLC, and ADD library material were made prior to requests to process absolute format records. Also check that no conflict exists in input/output assignments. If situation persists, request assistance from an IBM systems engineer.

11514 CHECK CONTROL DECK
Explanation: A System Generation control card is placed where none is expected, or a control card is not where it should be (example: LOCAT*M* followed by DELET*R*).
Corrective Action: Correct control card deck.

11515 MODULE XXXXXXXXXX NOT ON GO TAPE
Explanation: Occurs during library maintenance. The named subprogram was not immediately available on the SIU and was not found on the Go file.
Corrective Action: Check control deck. Subprogram name may be mispunched.

11516 SOF RECORD TOO LARGE TO COPY
Explanation: SG1, when working with largest possible records, cannot copy an SOF on a smaller machine than was used to generate the SOF.
Corrective Action: The records on the SOF cannot be copied on the size machine being used, with SG1 based where it is. Regeneration of the SOF is necessary.

11517 NO ALTERNATE LIBRARY HEADER
Explanation: SG1 has been directed to find an external library but did not find an identifying header record on LIB.
Corrective Action: Tape is probably wrong reel. Mount proper reel and begin again.

11518 (No message)
Explanation: A macro routine or a model statement has been specified, but does not appear on the system file. The questionable reference is printed on the SPR.
Corrective Action: Check control deck. The input to SG1 may be out of sequence.

11519 MACRO DIR EXCEEDS 240
Explanation: The Macro Library can have only 240 entries, and this number has been exceeded.
Corrective Action: Reduce number of macro routines to specified limit.

11520 NO SYSGEN END CARD
Corrective Action: Check control deck. System Generation will process the last card read as if it were followed by an END card. No action is required if all other cards are in order.

11521 HDR CD INVALID
Explanation: Column 60 of the EXEQ card indicates a header is desired on the output tape. The card following on the SIU is not a valid header card.
Corrective Action: Correct deck.

11522 CC60 OF EXEQ INVALID
Explanation: Column 60 of the EXEQ card has a digit other than "1" or "2".
Corrective Action: Correct the EXEQ card for the type of header desired.

11523 SOF EXCEEDS 154 LIMIT
Explanation: Tape SOF may have no more than 154 items, and this number has been exceeded.
Corrective Action: Deck may be in error. Some items may have been copied several times.

Disk-Oriented System

Diagnostic messages that may be produced on the console printer during execution of SG1 and SG2 are listed in sequence by message number in the following section. When one of these messages appears, processing halts and special end of program occurs unless the "Corrective Action" comment states that processing will continue or that no corrective action is to be taken. After the correction is made, the job must be rerun. Full instructions appear in the *Operator's Guide*.

SG1 AND SG2 DIAGNOSTIC MESSAGES FOR A DISK-ORIENTED SYSTEM

11521 HDR CD INVALID
Explanation: Column 60 of the EXEQ card indicates a header is desired on the output tape. The card following on the SIU is not a valid header card.
Corrective Action: Correct deck.

11522 CC60 OF EXEQ INVALID
Explanation: Column 60 of the EXEQ card has a digit other than "1" or "2".
Corrective Action: Correct the EXEQ card for the type of header desired.

11523 SOF EXCEEDS 154 LIMIT
Explanation: Tape SOF may have no more than 154 items, and this number has been exceeded.
Corrective Action: Deck may be in error. Some items may have been copied several times.

11562 CREATLIB NOT ON SOF
Explanation: SG1 has been executed, but the Create Library is not on the system.
Corrective Action: An SOF that includes the Create Library must be generated and this SOF used to process the job that caused the message.

11563 PACKAGE XXXXXXXXXX NOT IN CREATLIB
Explanation: No packet of the name XXXXXXXXXX has been found in the Create Library by SG1.
Corrective Action: Check the control deck to be sure that spelling on CREAT card is correct.

11564 OUTPUT ON XXX
Explanation: XXX is the x-control field for the unit on which the new output file is located.
Corrective Action: None.

11565 DISK LOADER NOT PRESENT
Explanation: IBSGDL has not been included or generated as the first item.
Corrective Action: Rerun the job including IBSGDL.

11566 NO SYSGEN END CARD
Corrective Action: Check control deck. System Generation will process the last card read as if it were followed by an END card. No corrective action is necessary if all other cards are in order.

11567 CHECK CONTROL DECK
Explanation: A System Generation control card is placed where none is expected, or a control card is not where it should be (example: LOCAT*M* followed by DELET*R*).
Corrective Action: Correct control card deck.

11568 (No message)
Explanation: A macro routine or a model statement has been specified but does not appear on the system file. The questionable reference is printed on the SPR.
Corrective Action: Check control deck. The input to SG2 may be out of sequence.

11569 SEQERR-XXXXX
Explanation: A macro statement sequence number with low-order blank or an out-of-order sequence number has been encountered in the SIU.
Corrective Action: Generation continues but the statement in question is omitted from the library and is printed on the SPR. Check the control deck.

11570 ALTERNATE LIBRARY HEADER
Explanation: SG2 has been directed to find a library but did not find an identifying header record on LIB.
Corrective Action: Tape is probably wrong reel. Mount proper reel and begin again.

11571 MODULE XXXXXXXXXX NOT ON GO FILE
Explanation: Occurs during library maintenance. The named subprogram was not immediately available on the SIU and was not found on the Go file.
Corrective Action: Check control deck. Subprogram name may be mispunched.

11572 XXXXXXXXXX NOT AVAIL
Explanation: An INCLD card has specified the name of an item which is not in the system.
Corrective Action: Check control deck for proper spelling of item name.

11573 XXXXXXXXXX NOT VALID
Explanation: An INCLD card has specified the name of an item which does not contain valid program information. The area assigned to SOF (on the disk) has been accidentally altered or destroyed.
Corrective Action: Reload the SOF from the output tape from the previous System Generation run.

Appendixes

Appendix A: Maintaining the History File with the SG3 Program

The History file, supplied by IBM as an optional item, contains all of the Autocoder statements (in the form of blocked, symbolic program decks) that make up the programs and modules contained on the Master file. The SG3 program is used to maintain the History file.

The SG3 program is executed in a standard job run. It cannot be run during System Generation.

Using SG3, a user can obtain a new History file when he:

1. Places new subprograms, in the form of Autocoder program decks, onto the History file.
2. Updates an old History file by inserting and deleting individual Autocoder cards.
3. Copies or merges information from one or more History files. The new History file is produced by a combination of copying and updating or by merging several old History files. A file of Autocoder statements can also be produced when the copy or merge is being carried out. This file is input to the Autocoder processor for the assembly of the updated file.

Additional features, such as a listing of the Autocoder source statements or a punched Autocoder source deck, are discussed under "Control Cards."

Program Input and Output Requirements

The input/output assignments and input/output formats associated with the SG3 program are indicated below.

Input Units:

1. Control cards and any new subprogram decks to be added to the History file are placed on the SIU.
2. The old History file is assumed to be on work file MW4 unless another of units MW1-MW9 is specified on the SG3 control card for the subprogram being copied or updated. (MW5 and/or MW6 may be required as output units as explained below.)

Input Format:

1. Standard Monitor and SG3 control cards are placed on the SIU. New subprograms or subprogram updating cards are Autocoder source cards.
2. The old History file is blocked, 25 card images per record.

Output Units:

1. A new History file, if specified, is always produced on MW5.
2. The Autocoder input file, if specified, is always produced on MW6.

Output Format:

1. The new History file is blocked, 25 card images per record.
2. The Autocoder input file consists of deblocked, card-image records.

Machine Configuration Requirements

SG3 requires: (1) the SOF plus a *minimum* of two additional tape units, a card reader, and the Standard Print Unit, or (2) the SOF plus a *minimum* of four additional tape units. The minimum configuration has the following restrictions:

1. Two runs are required. The first run updates the old History file. The second run creates the Autocoder input file. With an additional tape unit, these two functions are performed in one run by making the proper entries in the SG3 control cards.
2. Merging of History files cannot be performed with the minimum configuration. An additional tape unit is required for each tape to be merged with the old History file. Merging is performed by a sequence of SG3 control cards that direct reading in from the appropriate file and writing out on the same file.

In addition to the Standard Print Unit, one of the options utilizes the Standard Punch Unit. Users of SG3 should include these units in the System Monitor.

Control Cards

Four types of control cards are used to direct the SG3 program:

1. COPY to copy one or more subprograms from the old History file to a new History file.
2. UPDAT to add new subprograms to, or change subprograms already on, a History file. In either case a new History file is produced. To update a subprogram that appears on an old History file, the UPDAT card must be followed by groups of cards, each group consisting of an Insert/Delete control card followed by the Autocoder source cards (if any) that are to be inserted. An Autocoder input file is produced at the user's option. This is the source file used to assemble the updated or newly added subprograms.
3. Insert/Delete card to insert Autocoder cards into or delete Autocoder cards from the subprogram specified by the UPDAT card.

4. Comment card to insert descriptive information into an SPR-produced listing of the updated subprogram.

An optional procedure to be used when updating an existing History file is described under "UPDAT Optional Procedure," following the SG3 control card discussion.

The following control card discussion refers to *sequence numbers* and *revision letters.*

Sequence Number: This is a card sequence number from 0001 to 9999 that is placed in columns 1-4 of the output records produced by SG3. New sequence numbers are assigned when the old History file is modified.

Revision Letter: This is a single letter, A through Z, that indicates the level of modification of each subprogram on the History file. The letter is placed in column 5 of the output file(s). The UPDAT card permits the revision letter of a subprogram on the old History file to be advanced when the updated subprogram is written onto the new History file.

COPY CARD

CARD COLUMN	CONTENTS	EXPLANATION
1	$	None.
2-5	Blank	None.
6-8	MWn	The old History file is mounted on MWn, where n can be 1 through 9.
	Blank	If blank, the program assumes that the old History file is mounted on MW4.
9	Blank	None.
10	L	The subprograms being copied from the old History file are to be printed on the Standard Print Unit.
	Blank	No printing.
11	P	The subprograms being copied from the old History file are to be punched on the Standard Punch Unit.
	Blank	No punching.
12	H	The subprograms being copied here are to be written onto a new History file on MW5.
	Blank	No History file is written if there is any entry in columns 6-15. If columns 6-15 are *all* blank, the subprograms are to be copied from the old History file on MW4 to the new History file on MW5.
13-15	Blank	None.
16-20	COPY	Type of card.
21-75	*name*	This is the name of the Autocoder subprogram being copied with the options specified in columns 6-12. In the case of subprograms previously added to the History file by means of the UPDAT card SIU option, *name* is the entry beginning in column 21 of that card.
	name1, name2	This entry (including the comma) causes subprogram *name1* through subprogram *name2* to be copied from the old History file onto the new History file. If *name1* is the first subprogram and *name2* is the last subprogram on the old History file, the entire file is copied.
76-80	Blank	None.

UPDAT CARD

CARD COLUMN	CONTENTS	EXPLANATION
1	$	None.
2,3	Blank	None.
4,5	$$	If there is a $ in column 4 *and* in column 5, the revision letter on the new History file is set to "A" for this subprogram. If this option is not selected, column 4 is blank.
5	Any alphabetic character	This letter is compared to the revision letter (column 5) of the old History file subprogram being updated. If the comparison is *unequal,* the job is terminated. This check is made to ensure that updates are performed sequentially. If a subprogram is updated into a new History file (see column 12), revision letters are incremented by one letter (A to B, B to C, . . . Z to A, etc.) *except* where the UPDAT card has $ in columns 4 and 5. If a subprogram is copied to the new History file, the revision letters are not changed.
	$	This entry causes the revision letter comparison described immediately above to be bypassed.
		NOTE: For any entry in column 5, SG3 resequences columns 1-4 of the output files.
6-8	MWn	The old History file is mounted on MWn, where n can be 1 through 9.
	Blank	If blank, the program assumes that the old History file is mounted on MW4.
	SIU	This entry indicates that a new subprogram is to be added to the History file. The cards containing the source statements follow this UPDAT card in the SIU.
9	Blank	None.
10	L	This subprogram on the new History file is to be printed on the Standard Print Unit.
	Blank	No printing.
11	P	This subprogram on the new History file is to be punched on the Standard Punch Unit.
	Blank	No punching.

CARD COLUMN	CONTENTS	EXPLANATION
12	H	The subprogram named beginning in column 21 of this card is to be written onto the new History file on symbolic unit MW5.
	Blank	No History file is written if there is any entry in columns 6-15. If columns 6-15 are *all* blank, the subprogram is to be written on both the new Autocoder input file and the new History file. In this case (columns 6-15 are all blank), the old History file is assumed to be on MW4, the new History file on MW5, and the new Autocoder input file on MW6.
13	A	Write card-image records to form the new Autocoder input file on MW6 for later assembly.
	Blank	No Autocoder input file is produced.
14	1-7, or Blank	If column 13 contains an "A", the SG3 program produces an EXEQ, AUTOCODER card-image record for each UPDAT card processed. This "card" specifies the options for the Autocoder assembly of the subprogram named in columns 21-30. All options for this "card" except the NOFLG option, are specified by the entry in column 14. The column 14 options for the (SG3-produced) EXEQ AUTOCODER "card" follow and are explained in the publication, *System Monitor*. 1–NOPRT 2–NOPCH 3–NOPRT,NOPCH 4–NOMAC 5–NOPRT,NOMAC 6–NOPCH,NOMAC 7–NOPRT,NOMAC,NOPCH Blank–No options. NOTE: The SG3-produced EXEQ "card" is ignored for the first UPDAT card (and the updating cards associated with it) processed. Options for the assembly of a single subprogram, or the first of two or more subprograms, are specified on the MON$$ EXEQ AUTOCODER card provided by the user. This card must follow the last UPDAT card, with its related updating cards, in the SIU.
15	N	If an "A" is specified in column 13, an "N" in this column indicates the NOFLG option when this subprogram named beginning in column 21 is later assembled in accordance with the SG3-produced EXEQ card (refer to column 14 explanation).
	Blank	No option.
16-20	UPDAT	Type of card.
21-75	*name*	This is the name of the Autocoder subprogram being updated with the options specified in columns 4 through 13. *Name* must be left-justified in column 21 and must not exceed ten alphameric characters. The first character of *name* must be an alphabetic character.
		If columns 6-8 contain "SIU", *name* is placed on the History file to identify the subprogram that is being added. This *name* is used for all subsequent COPY and UPDAT cards to identify the subprogram.
76-80	Not Blank	The contents of these columns are placed into the Identification field (columns 76-80) of the History file and/or Autocoder input file for each card in the subprogram.
	Blank	The Identification field of the subprogram is carried unchanged.

INSERT/DELETE CARD

Insert/Delete cards pertain to the subprogram designated on the last preceding UPDAT card. An Insert/Delete card directs SG3 to insert the immediately following Autocoder cards into or delete them from the subprogram specified on the UPDAT card. The point at which the insertion or deletion is to be made is specified on the Insert/Delete card.

CARD COLUMN	CONTENTS	EXPLANATION
1	$	None.
2-10	XXXX	The Autocoder cards that follow this Insert/Delete card are to be inserted into the subprogram named on the last preceding UPDAT card. Within the subprogram the insertion is to be made immediately following the subprogram card identified by sequence number XXXX. This sequence number is a one- to four-digit number, written free form, left-justified (e.g., 829 or 2932). SG3 inserts new sequence numbers on the output file(s). NOTE: The revision letter is not part of the sequence number.
	XXXX, YYYY	The cards with sequence numbers from XXXX through YYYY are deleted from the subprogram named in the last preceding UPDAT card, and the Autocoder cards (if any) that follow this Insert/Delete card are inserted immediately following the card identified by sequence number XXXX. The sequence number is a one- to four-digit number written free form, left-justified. SG3 inserts new sequence numbers on the output file(s).
11-80	Blank	None.

Example 1: $25 beginning in column 1 means: Insert the Autocoder cards following this control card into the output file(s) behind the card with sequence number 0025.

Example 2: $4310,4376 beginning in column 1 means: Delete cards with sequence numbers 4310 through 4376 and insert the Autocoder cards following this control card in place of the deleted cards on the output file(s).

COMMENTS CARD

CARD COLUMN	CONTENTS	EXPLANATION
1	$	None.
2-5	Blank	None.
6	*	None.
7-80	*comments*	The contents of this field are printed on the Standard Print Unit when encountered during execution of the SG3 program.

UPDAT OPTIONAL PROCEDURE

An optional procedure may be used when *updating* an existing History file. The procedure eliminates the need for COPY cards for subprograms to which no change is to be made. The following Monitor control card effects the optional procedure.

```
6           16      21
MON$$       EXEQ    SG3,,,COPY
```

Description: SG3 copies all subprograms up to the subprogram names in the first UPDAT card. This subprogram is processed according to the options specified in the UPDAT card. Subsequent subprograms are copied up to the subprogram named in the next UPDAT card or until the end of the last subprogram on the old History file.

Restrictions on Use of Optional Procedure:

1. This procedure can be used only when a single History file is being updated.
2. No UPDAT card is permitted with an SIU parameter. That is, new subprograms cannot be added to the History file.
3. COPY cards must not be used.

Example: Figure 25 illustrates the use of the SG3 control cards to update a History file. Subprogram SAMPLE3 is to be copied from the old History file on MW4 to the new History file on MW5. Subprograms SAMPLE1 and SAMPLE2 are to be updated and placed on the Go file; then SAMPLE2 is to be executed. Following is a brief explanation of the control cards.

The first UPDAT card causes SG3 to:

1. Print a listing on the SPR.
2. Punch an Autocoder deck on the SPU.
3. Place SAMPLE1 on a new History file on MW5.

The source deck follows the UPDAT card in the SIU.

4. Place SAMPLE1 on the Autocoder input file on MW6.

The second UPDAT card causes SG3 to:

1. Update SAMPLE2, a subprogram on the old History file, MW4, onto the new History file following SAMPLE1.
2. Place SAMPLE2 on the Autocoder input file following SAMPLE1.

Insert/Delete cards $24 and $35,46 indicate where the modifications in SAMPLE2 are to be made. Updating Autocoder cards are placed in the SIU as indicated by the comment cards in the example.

```
     MON$$      JOB  HISTFILE
*** MONITOR ASSIGNMENT CARDS ***
     MON$$      ASGN MJB,A1
     MON$$      ASGN MGO,B2
     MON$$      ASGN MW4,A6
     MON$$      ASGN MW5,A2
     MON$$      ASGN MW6,A3
     MON$$      MODE GO
     MON$$      COMT BUILD HISTORY FILE CONSISTING OF SAMPLE1 FROM SIU
     MON$$      COMT AND SAMPLE2 & SAMPLE3 FROM EXISTING HISTORY FILE.
     MON$$      EXEQ SG3
$    SIU LPHA   UPDATSAMPLE1

          (INSERT SYMBOLIC CARDS FOR HISTORY FILE.)

$   $           UPDATSAMPLE2                                          NEWID
$24

          (SYMBOLIC CARDS TO BE INSERTED FOLLOWING CARD 24
           OF SAMPLE2 ARE PLACED HERE.)

$35,46

          (DELETE CARDS 35 THROUGH 46.
           SYMBOLIC CARDS TO BE INSERTED BEFORE CARD 47
           OF SAMPLE2 ARE PLACED HERE.)

$             COPY SAMPLE3
     MON$$    COMT EXECUTE AUTOCODER TO COMPILE SAMPLE1 & SAMPLE2
     MON$$    EXEQ AUTOCODER,,MW6
     MON$$    COMT EXECUTE LINKLOAD TO BUILD A JOB FILE
              EXEQ LINKLOAD
              PHASEPROGRAMA
              CALL SAMPLE2
     MON$$    COMT EXECUTE PROGRAMA
     MON$$    EXEQ PROGRAMA,MJB
*** DATA CARDS - OPTIONAL ***
     MON$$    END          OR
     MON$$    JOB  NEXT JOB
```

Figure 25. Control Cards Needed to Update a History File

The COPY card causes SAMPLE3 to be copied from MW4 to MW5, the new History file.

The EXEQ AUTOCODER card causes SAMPLE1 and SAMPLE2 to be assembled from the Autocoder input file (MW6) and placed on the Go file.

The EXEQ LINKLOAD card and the following two cards cause SAMPLE2 to be placed onto the Job file.

The EXEQ PROGRAMA card causes PROGRAMA to be executed from the Job file.

SG3 Diagnostic Messages

The following diagnostic messages may be produced on the Standard Print Unit during an SG3 run.

11540 DIAGNOSTIC END. LAST SIU CARD IS . . . . (contents of erroneous card)

11541 REQUESTED UPDAT SUFFIX CHARACTER DOES NOT MATCH FILE SUFFIX CHARACTER
The suffix character referred to in this message is the revision letter.

11542 REQUESTED FILE NOT ON HISTORY FILE

11543 THIS RUN HAS BEEN DIAGNOSTICALLY TERMINATED. THE LAST FILE IS POSSIBLY ERRONEOUS.

11544 CAPACITY OF FILE HEADER TABLE HAS BEEN EXCEEDED
The capacity is 400 headers.

11545 UNEXPECTED END OF FILE ON MWx
x may be 5 or 6. This occurs when the file exceeds the capacity of the output tape.

Whenever any of the above messages is produced, SG3 converts to a diagnostic mode that only checks remaining SG3 cards. Each incorrect card results in the following message:

11546 ****bbERROR IN FORMAT OF CARD . . . (contents of erroneous card)

Appendix B: Operating System Core-Storage Requirements

The values below provide guidelines to estimate the core-storage requirements for an Operating System. The figures are subject to change as modifications are made to the system. (New figures will be published should a change of more than ten percent occur.)

Resident Monitor Requirements

	CORE-STORAGE LOCATIONS REQUIRED	
Basic Resident Monitor (NOTE 1)		
Completely tape-oriented, 1-channel IOCS	7,820	
Completely 1301 disk-oriented, 1-channel IOCS (NOTE 2)	11,640	
Tape-oriented with 1301 disk capabilities, 1-channel IOCS	9,320	
Additional tape IOCS channels	600	each
Additional 1301 disk IOCS channels	350	each
Optional System Functions		
Standard Print Unit		
Unit-record	240	(NOTE 3)
Tape Unit	210	(NOTE 4)
Standard Punch Unit		
Unit-record	200	(NOTE 3)
Tape Unit	210	(NOTE 4)
Core-Image file capability	40	(NOTES 4 and 5)
Labeled system files (80 or 120 characters)	40	(NOTE 6)
Alternate Input Unit (AIU) capability	140	
Snapshot	2,000	(NOTE 7)
Optional IOCS Routines		
Unit-record	250	(NOTE 3)
80-character tape labels	1,200	(NOTE 6)
120-character tape labels	1,400	(NOTE 6)
Label exit routine	350	
Tape error statistics	575	
Implementation of user-written service routines	450	
Checkpoint, IBM 7330 Tape Units not specified	300	(NOTE 5)
Checkpoint, IBM 7330 Tape Units specified	350	(NOTE 5)

Optional Resident Monitor Requirements for TP

Extension of IOCS	1,650	
One of the following Supervisors:		
No dump and restore capability	5,200	
Dump and restore capability	6,350	
Tele-Processing Only	5,400	
"Start" and "end" modules, 1-channel TP	58	
Additional "start" and "end" modules for the second TP channel	58	
For device indicated:		
Programmed Transmission Control	2,600	per channel
IBM 1414, Model IV or V with IBM 1009 Data Transmission Unit	1,900	per adapter
IBM 1414, Model IV or V with IBM 1404 Remote Inquiry Unit	1,250	per adapter
IBM 1414, Model IV or V with Telegraph Terminal Unit	1,150	per adapter
One of the following load programs:		
Absolute tape loader	2,500	
Absolute 1301 disk loader	4,250	
Relocatable tape loader	6,000	
Relocatable 1301 disk loader	4,900	

Nonresident Requirements

	CORE-STORAGE LOCATIONS REQUIRED		
	TAPE ORIENTED	NOTE	DISK ORIENTED
Compilers			
Autocoder	19,000	8	29,050
COBOL	28,500	9	38,950
FORTRAN	26,550	10	35,550

	CORE-STORAGE LOCATIONS REQUIRED
Utility Programs	
Snapshot	2,000
Core-storage dump	8,000
Tape Dump	7,000
1301 disk dump	11,000
Random-Processing Scheduler	
Basic	3,300
DEFSA macro	180
MVRSA macro	250
PUT macro	375
FSEQP macro	850
Output only	180
Each 1301 disk module	13
Additional Tele-Processing Programs	
TPATLIBGEN	18,000
TPRTLIBGEN	7,750
TPADLIBGEN	19,200
TPRDLIBGEN	3,850 + Directory Area (NOTE 11)
TPLDDCP1	500
TPLDDCP2	500
Linkage Loader	
Tape	25,600
1301 Disk Storage	30,200
System Generation, Tape or 1301	
Disk Storage	27,000
Transitional Monitor	
Tape-oriented system	13,340
Disk-oriented system	15,250
POWTRAN	1,500
Core Image file capability	670
Restart	
1-channel IOCS	3,500 (NOTE 12)
Additional IOCS channels	600 each
Depending upon inclusion of some or all optional system functions (excluding Snapshot)	25 to 625 (NOTE 4)

NOTES

NOTE 1: These figures include all index registers (and floating-point areas for the 7010).

NOTE 2: The disk-oriented Resident and Transitional Monitors must include the 1301 disk IOCS routines.

NOTE 3: When the Standard Print Unit and/or Standard Punch Unit are specified as unit-record equipment, the IOCS unit-record routine must be included.

NOTE 4: The following file assignment core sizes must be added where applicable:

Each symbolic unit—5
Each unit-record device—9
Each tape unit (MDM specified)—14
Each tape unit (MDM not specified)—9
Each disk area—20

NOTE 5: When MDM (Core Image file) is specified, IOCS Checkpoint must be included.

NOTE 6: When labeled system files are specified, the corresponding (80- or 120-character) IOCS label routine must be included.

NOTE 7: Since Snapshot begins at an even-hundred core-storage location, up to 99 additional positions may be required.

NOTE 8: All remaining available core storage is used by Autocoder as follows: 70% for label table; 30% for literal table.

NOTE 9: All remaining available core storage is used by COBOL for tables.

NOTE 10: All remaining available core storage is used by FORTRAN for tables.

NOTE 11: The size of the Directory area is 14 times the number of Tele-Processing programs involved in building the library.

NOTE 12: When Restart is desired, IOCS Checkpoint must be specified.

Appendix C: IOCS Timing Estimates

Timing estimates for the IOCS can be made from the following information.

SCHEDULING FUNCTIONS (NOTE 1)	TIMING IN MICROSECONDS IBM 1410	IBM 7010
1. Blocking/unblocking of GET or PUT, time per record (NOTE 2):		
a. GET or PUT, Form 2 data records	370	130
b. GET, Form 4 data records	370	130
c. PUT, Form 4 data records	595	210
2. GET FILE:		
a. One IORW is sent to a read/write list; file consists of unblocked records; not preceded by a GET FILE, DEFER	2,747	879
b. GET FILE following a GET FILE,DEFER; file consists of unblocked records	1,274	408
c. *Additional* time for a GET FILE if file consists of blocked records	486	155
3. GET FILE,DEFER	2,322	743
INPUT/OUTPUT FUNCTIONS		
1. Service an interrupt due to the completion of an overlapped operation; no error conditions; another IORW is added to a file list (NOTE 3)	2,075	648
2. Start a pending operation and return to an interrupted instruction (NOTE 3), where		
u – not overlapped	851 u	277 u
o – overlapped	549 o	173 o
3. To start SEEK operation, non-sequential	1,470 + 50M	560 + 16M
4. Additional time to start SEEK operation, full-track sequential	890	300
5. To start input/output operation after detecting SEEK complete interrupt	1,450 + 50M + 50n	555 + 16M + 16n
6. Additional time to start input/output operation if another module, having a higher priority, has a SEEK pending	820 + 50p	350 + 16p

In the table:

M – Total number of modules on same channel.

n – Placement of object module in module table as determined by the DSKDF macro-instruction (for module 00, n = 1; for module 01, n = 2; etc.)

p – Placement of module with SEEK pending in module table as determined by the DSKDF macro-instruction (for module 00, p = 1; for module 01, p = 2; etc.)

NOTE 1: The times listed for the scheduling functions are generally overlapped with respect to all channels.

NOTE 2: If a GET or PUT must move a data record, add the time required for the move to the times listed.

NOTE 3: These times are not overlapped with respect to the channel being serviced except for SEEK operations in process.

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Reader's Comments

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